ELECTRICAL
REVIEW
ILLUSTRATED
A weekly Journal of
ELECTRIC LIGHT AND POWER,
TELEGRAPH, TELEPHONE &
SCIENTIFIC PROGRESS.
Vol. 12, No. 11.
May 12, 1888.
NEW YORK, U.S.A.
$3.00 Per Annum.
Single Copies, 10 Cts.

THE CONSOLIDATED ELECTRIC LIGHT CO.

GEORGE WESTINGHOUSE, Jr., President,

OWNERS OF THE

SAWYER-MAN PATENTS,

GENERAL OFFICE:

32 Nassau Street, New York.

TOTAL NUMBER OF INCANDESCENTS

IN USE

UNDER THE PROTECTION

OF THE

SAWYER-MAN PATENTS,

December 15, 1887,	**308,302**
April 15, 1888,	**460,063**
Increase for the Last Four Months,	**151,761**

DETAILED LIST OF PLANTS AND STATIONS WILL BE MAILED ON APPLICATION.

SAWYER-MAN ELECTRIC CO.

HENRY C. DAVIS, President,

COMMERCIAL AGENTS OF

THE CONSOLIDATED ELECTRIC LIGHT CO.,

GENERAL OFFICE:

32 Nassau Street, New York.

FACTORY:

510 to 534 WEST 23d STREET, NEW YORK.

ELECTRICAL REVIEW

ILLUSTRATED.

A WEEKLY JOURNAL OF

Electric Light, Power, Telephone, Telegraph and Scientific Progress.

VOL. 12, No. 11. WEEKLY. | NEW YORK, SATURDAY, MAY 12, 1888. | $3 per annum. Single Copies, 10 Cents.

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Entered at Post Office, New York, as Mail Matter of the Second Class.

The Tesla System of Distribution and Electric Motors for Alternating Currents..

Six patents were issued last week under date of May 1st to Nickola Tesla, involving the various features of his very remarkable system of distribution and transmission of power by alternating currents, which are at the same time adapted for the production of light. The system is based upon a novel principle, which is very clearly set forth in the claim of one of the patents, namely, producing a continuously progressive rotation of the polarities of either or both elements (the armature or field magnet or magnets) of a motor, by developing alternating currents in independent circuits, including the magnetizing coils of either or both elements; and as a modification of this, shifting the poles of one element by alternating currents while magnetizing the other element by direct or continuous current.

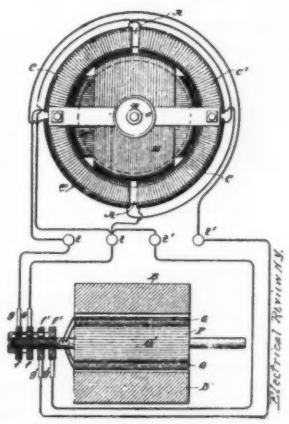
One of the most interesting forms shows a generator of alternating currents whose armature contains two independent circuits of varying phase, and these two circuits are connected with the field-magnet coils of the motor in such manner that the alternating impulses in these two circuits will produce a continuous rotary shifting of the poles of the field-magnet and communicate a rotary effort to the armature, which in itself is a body of iron with coils of wire, whose circuit is entirely closed. That is, there is no communication whatever of the armature circuit with any other circuit, and consequently there is no commutator, collector or brushes of any kind carried by the armature. It will thus be seen that there is here developed a curious and interesting phase in the construction and operation of electric motors, and one which is entirely novel, in that there is no portion of the entire motor subject to wear and tear in even the slightest degree, except the shaft and its bearings. The direct consequence of this in the commercial use of motors is of great importance, as the attendant having charge of an electric motor of this character would have no more responsibility than he would have in looking after the lubrication of a counter-shaft.

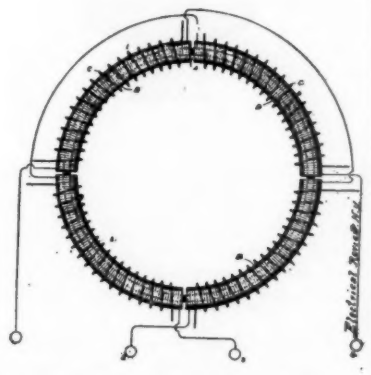
Another interesting feature is the result of perfect synchronism between the motor and generator which arises from the peculiar principle of operation of the motor, and the latter can be constructed to run at a predetermined speed provided the speed of the generator and that of the motor have a common divisor. The practical result of this is perfectly constant speed in the motor with constant potential supply, no matter how much the load may vary on the motor. The motor when running at its highest attainable speed reverses almost instantaneously, on a reversal of the line connections, so that the simple motion of the switch effects the instantaneous reversal of the direction, and the time occupied in changing from highest speed in one direction to highest speed in the opposite direction is but a fraction of a second. The rotary effort of the armature is very great, and there is no difficulty whatever attendant upon the starting of the motor under load. The efficiency is extremely high, and can be increased to the highest possible extent attainable by continuous current motors.

The system also takes with it the novel construction and operation of transformers, a simple form of which is illustrated by Fig. 2, which shows a closed magnetic circuit wound with four primary coils which are connected into two high tension circuits in such manner as to produce two consequent poles at opposite ends of a diameter and these by the action of the generated current in the high tension circuits progressively shifting around the magnetic circuit, carrying the consequent poles continuously around; in other words, the two consequent poles rotate continuously, the winding of course remaining stationary. The secondary coils are wound on the primaries and can be connected among themselves in any desired manner according to the work to be performed.

It will be observed, therefore, that the action of the alternating currents is not to reverse polarities of the core, but to simply rotate them by the peculiar action of the current impulses in the two primary circuits, and it seems to follow as a matter of course that there is less energy wasted in the conversion than occurs in the ordinary converter where the magnetic poles are alternately reversed. Instead of using four wires from the generator three can be used and one of the three forming a common return for the other two.

Altogether, Mr. Tesla is to be congratulated, not alone on having produced something entirely novel in the electrical world, but also for having made thoroughly practicable the utilization of alternate currents for the transmission of power. The motors for a given out-put of mechanical energy are extremely small and are, as stated, absolutely self-regulating and there is no electrical element of wear and tear connected with them in any manner whatever, and this feature alone of the closed circuit armature without external connections stamps the series of inventions as being something entirely new and original, and it looks as though the new principle would have great influence on the application of alternating currents to practical forms of electric motors, and we congratulate Mr. Tesla upon his success in this direction.





FIGS. 1 AND 2.—THE TESLA SYSTEM OF TRANSMISSION OF POWER AND THE DISTRIBUTION OF ELECTRICAL ENERGY.

The Way the New English Rules are Received.

The much dreaded and long looked for rules and regulations recommended for the prevention of fire risks from electric lighting have at last been issued by the Society of Telegraph Engineers and Electricians. We may at once state, although our readers can judge for themselves, that they are absolutely innocuous, and it is a marvel to us that the protracted labors of 22 gentlemen of the highest eminence should have resulted in bringing into the world such a pigmy. We believe the conception of the idea took place at least three years since, so the tiny offspring of the committee has had ample time to germinate into a finely developed specimen of its kind, but alas, it might also be placed in the category of the still-born. There is, however, one redeeming feature in the compilation; these puerile rules are not intended to clash with others which fire offices may issue for their own protection, and it is not likely that they ever will. The rules, such as they are, nevertheless offer a few opportunities for comment. We are told that whatever insulating material is employed, it should not soften until a temperature of 170° Fahr. has been reached. Are we not correct in asserting that one of the most extensively used materials for insulating electric light conductors would attain the consistency of putty long before this temperature was approached; and is this to be tabooed entirely? The vagueness too, or rather *naïveté*, of rule 7 is delightful, and we venture to suggest that the proximity of conductors should be governed by other conditions than that of mere potential differences. The "factor of safety," also in estimating the sectional areas of leads, appears to us excessive. A skilled engineer would assuredly calculate the weights of his copper within smaller limits than that proposed, and still be on the right side. We are rather surprised that the use of fluids for soldering was not condemned, unless an exception is made in favor of Venice turpentine, which nobody seems to think of using, although it was always strongly recommended by the late Robert Sabine. It is not altogether improbable that a non-technical reader of the paragraphs relating to dynamos would come to the conclusion that they are exceedingly dangerous in positions where, so far as we are aware, they have already been extensively used without any accident. It would be however only a waste of time to seriously discuss the matter at greater length, for we are decidedly of opinion that the remarkable publication to which we have alluded will no sooner be read than laid aside and forgotten. —*London Electrical Review.*

Testimonial to President Duncan.

A very pleasant little affair occurred during the visit of President Duncan, of the National Electric Light Association, to this city last week. Friday evening he was invited to dine with a few of his friends, and a very delightful dinner was discussed in one of the parlors of the Hotel Dam. At the conclusion Mr. Cyrus O. Baker, Jr., in a few eloquent and impressive words, presented Mr. Duncan an elegant watch chain and locket, the latter containing a miniature photograph of each of the donors, Messrs. Stanley, Baker, Manson, Ross and Price. The locket surface has a head of Jupiter cut on it with an electric design beneath, and the chain is composed of gold and platinum, the whole comprising a beautiful and valuable testimonial. Mr. Duncan was taken completely by surprise, but was able to most pleasantly respond. A letter from Mr. A. V. Garratt, of Boston, to whom the donors were indebted for the excellence of the photographic work, was read and applauded, and toasts were responded to by all the gentlemen present.

This kindly act grew out of the very courteous and hospitable treatment received by the gentlemen at the hands of Mr. Duncan while they were attending the telephone and electric light conventions in Pittsburgh.

At the conclusion of the dinner the entire party returned to the Electric Club and spent a very pleasant evening.

Telephone Girls Deprived of Gum.

Says the very mean *Detroit Journal:* There were weeping and wailing and gnashing of teeth in the telephone stations the other day, over a new order. The hello-girls have bowed in submission to the order, that there shall be no reading, no sewing, no crocheting, no drawn-work, while they are on duty. But when the order was issued forbidding them to chew gum, they felt that the time had come to strike till the last armed foe should expire. Conferences were held and cabals formed, but in the end quiet was restored, and the gum was thrown out of the window. The reason for the order was simple. When a subscriber calls for, say, 4378–3r, the girl with the gum would repeat: "Fortythreeseventyeightthree rings."

Then the subscriber would say it again, and again would come back the Greek word for pot-pie. Anger would be kindled, the wires would become superheated and 1,000 would get the complaint that the girls were impudent; and yet it was all due to the gum.

The Nashville, Tenn., Electric Light and Power Company has been organized with A. L. Landis as president, and A. L. Landis, Jr., secretary and treasurer. They have been granted right of way, and will soon want bids on machinery.

The Improved "Bartholdi" Automatic Gas Lighting Burner.

In examining or studying the course of evolution of any special mechanical structure by reference to the preceding state of the art, we can most generally trace it back, step by step; and although we readily perceive each embodiment to be an advance over preceding forms, still, as though inventors were by tradition bound to one original general plan of construction, it is rare that we meet with any radical alteration in principle.

One exceptional case in this regard is shown in an automatic electric gas lighting burner christened by its manufacturer and owner, Mr. A. L. Bogart, of this city, the "Bartholdi."

The methods of operation and construction, in its principal features, vary in almost every detail from preceding structures for similar purposes, the object of such variation being to overcome objections that had hitherto existed. Thus, instead of the valve-operating mechanism being outside of the gas-pipe, it is contained within it thereby obviating friction due to packing of valve-stem or springs to hold valve in its barrel; instead of using the traditional rotary conical gas-cock requiring to be lubricated and held firmly to its seat by pressure of a screw or spring, an extremely small clack-valve is employed which in opening is simply *lifted from its seat one-sixteenth of an inch;* the armature (but one being employed) instead of making an extended excursion has for its maximum movement the play of the valve, to which it is rigidly connected by a valve-stem, and the armature motion is a double one, it being first attracted upward to open the valve and then rotated horizontally so as to engage a recess in it with a stationary hook, thus locking it open. To extinguish the flame it is only necessary to energize a second pair of helices, when the armature is raised, rotated free of the hook and then dropped into its normal position closing the valve.

Since the first introduction of this burner to the public, various improvements have been made upon it to perfect it theoretically as well as practically. One of the most important as well as ingenious, dates since the beginning of this year, and is upon the construction and mode of operation of the spark-producing electrode.

We above illustrate the burner in perspective in fig. 1; fig. 2 being a sectional view. *D* is a shell containing the helices four in number of which only two, *MP*, are shown; the four by means of the iron disk, *K*, constituting two horse-shoe magnets. The armature, *J*, is suspended below the cores, by means of the valve-stem, *H*, which is attached to the conical valve, *G*. When a current is passed through two of the helices, the armature is raised and rotated to the left into the position indicated by the dotted lines, bringing the recess, *d*, over the hook, *e*, and when the current is broken the armature falls upon this hook locking it and holding the valve above its seat permitting egress of the gas. The spark producing mechanism referred to above, consists of an arm, *UV*, bent at right-angles and passing through the wall of the tip-socket at *V*, and terminating over the valve at *W*, the point, *V*, constituting a valve and valve-seat, the spring, *ip*, at all times pressing these two parts together and keeping them gas-tight, and at the same time pressing the two platinum sparking points, *UT*, into contact. Therefore when the valve is first lifted it reaches the termination, *W*, of the vibrating lever, *WVU*, and pressing it upwards breaks the circuit at the points, *TU*, producing a spark; as a consequence a vibrating action with a continuance of sparking results as long as the operating key is kept closed with the finger as in other burners for a similar purpose. To extinguish the lighted gas, it is only necessary to close the circuit through the other two helices to the ground, when the armature is lifted and rotated free of the locking hook and dropped when the circuit is opened at the key.

It will be seen that the valve cannot be possibly opened by accident; that on account of the extremely short movement of the armature, but small current is required to operate it, and that with the same amount usually employed with automatics, the Bartholdi will have far greater power to overcome any tendency to stick through deposit from the gas. No springs, or parts requiring any adjustment, are found within the burner.

It is extremely small in size and attractive in appearance.

FIG. 1.

FIG. 2.

Stealing Electric Lamps.

The Colarado Electric Light Company is being put to considerable expense, and the citizens to a great deal of discomfort and inconvenience, owing to theft of lamps on the one hand, and the malicious breaking of them by young or old hoodlums on the other. Another complaint is that the lamps are tampered with and the citizens deprived of the benefit of light.

On Larimer, Curtis, Broadway, and on the North Side, a great number of lamps have been broken nightly. It is suspected by some that brainless boys and young "fly-bucks" smash them out of pure deviltry, while others are inclined to believe that thieves, such as burglars and footpads, break them so as to facilitate their movements, for as soon as broken the light goes out.

Night before last over twenty of the lamps were unscrewed and carried off from Larimer street. Other similarly much-travelled streets have been raided, and the little pear-shaped glasses taken away, until many hundreds of them have been stolen. The officers of the company cannot imagine why they are stolen, for there is no market here for them.

It is suspected that some one else besides mischievous boys and thieves are at the bottom of the whole thing, probably for the purpose of bringing discredit upon the company. On South Broadway all the lights have been found extinguished, and on employés of the company investigating the matter, it has been discovered that the glass lamps have been unscrewed just sufficiently in their sockets to break the contact, and thus cause extinguishment of the light. Some one who knows something of the working of electricity and electrical apparatus, is undoubtedly the "operator" in these instances. The company's officers say they will pay liberally for information which will lead to the detection of the perpetrators of these malicious acts.

As to the stealing of the lamps, it seems curious that twenty, all in one row, could be stolen, as was the case on Larimer street, without the thief attracting the attention of the ordinarily watchful police force, or that of some of the very shrewd detectives of the city force whose time is spent in arresting people on "suspicion."—*Denver Times.*

—— The Portland (Oregon) Gas Company will light that city by electricity as soon as the necessary installation can be made.

—— There is a constant demand for an increased number of electric lamps by citizens in nearly every city in this country lighted by electricity.

The Elongation and Contraction of Metals in Magnetic Fields.

It has long been known that a bar of iron when magnetized by a surrounding solenoid alters its length, and with the weak magnetizing forces which were originally employed in these experiments, the alteration was invariably an increase in length. One of the earliest experimenters, and probably the original discoverer of this behavior of iron when magnetized, was Joule; but he invariably found that the length increases with the magnetizing force. In his experiments, however, the magnetizing force did not exceed 87 C.G.S. units, and an ingenious theory was propounded to show that elongation must take place when a bar of iron is magnetized. It was believed that the molecules as they rotate under the influence of the lines of force, and become more or less parallel, they naturally require more room in the direction of the length of the rod, and therefore cause the latter to extend with a corresponding decrease of diameter. This simple expanation was refuted by the experiments of Mr. Shelford Bidwell, which he made some years ago, and in a paper communicated by him to the Royal Society in 1885, he showed that the elongation does not remain unchanged at its maximum when the magnetizing force exceeds that which is sufficient to produce so-called saturation; but, on the contrary, that with increasing magnetizing forces beyond this limit the elongation becomes less until the rod, after returning to its original length, ultimately becomes actually shorter than it was in the unmagnetized condition. Mr. Shelford Bidwell has, however, recently contributed to the Royal Society, another paper on the same subject, and in this he points out that his original investigations might be open to the following objections: (1) The field due to the magnetizing solenoid was not quite uniform; (2) the effect of the ends of the rods was uncertain, and might have played some material part in the production of the phenomena in question; (3) all the rods used in the experiments retained a certain amount of permanent magnetism. To meet these objections he has carried out a further series of experiments by using rings instead of rods of iron, and observing the changes of diameter. The rings were also demagnetized before every observation, and the battery employed was much stronger than that used in the first experiments, so as to produce very great magnetizing forces. He found that in their general character the phenomena of elongation and contraction were the same with rings and with straight bars, thus proving that the effect of magnetization was independent of the form of the iron, and as it was much easier to obtain intense fields with straight than with circular solenoids, the author made some further experiments with straight rods. These experiments embraced iron, cobalt, nickel, manganese steel, and bismuth, and the highest magnetizing force reached was 840 C.G.S. units. We are able, by the courtesy of Mr. Shelford Bidwell, to publish herewith a diagram showing the behavior of iron, cobalt and nickel in magnetic fields of varying intensity. The strength of field is plotted on the horizontal, and the change of length in ten millionths of the original length of the rod is plotted on the vertical, the elongations being plotted above, and contractions below, the axis. The line of bismuth, which metal was tested in fields varying from 500 to 840 units, almost coincides with the axis, and manganese steel was also found to be almost unaffected, the elongation in a field of 850 units being only about one-fifty millionth of the length. That the change of length in the other metals which are sensibly affected by magnetization cannot be due to the mechanical stress produced by magnetic attraction between the ends of the bar, is shown by the author in the case of iron where mechanical stress does not account for more than one-fifth part of the observed magnetic contraction. It should also be remembered that up to a magnetizing force of 280 units, iron elongates, and, therefore, the mechanical stress in iron opposes magnetic extension.—*Industries.*

Electric Work in Belgium.

The Belgian Society of Electricians have offered a reward of £10 for the best elementary essay on applied electricity. Either members or non-members of the Society, irrespective of nationality, may compete for this prize, and the essay must be written in such a way that persons of ordinary education and ignorant of the science of electricity may understand it.

Messrs. Mourlon Frères, of Brussels, are now pushing an American petroleum engine for domestic electric light installations, and several exhibits will be on view at the forthcoming Exhibition, where they will be employed for lighting some cafés and restaurants in the gardens. An interesting novelty, for Belgian visitors at least, will be high power incandescent lamps ranging from 200 to 1,200 candles. In my letter of the 13th March, says a correspondent, I gave some particulars of the illuminated fountains which will be used at this Exhibition. Since then the work has been actively pushed forward, and some preliminary trials made with great success. Complaints are being made in connection with the electric lighting of the interior of the Exhibition, as it is now considered probable that the contracts will be reduced to one hundred lighting hours.

An Electric Light Plant in a Newspaper Office.

There is a very complete electric light plant in the new building of the *Post-Dispatch*, St. Louis. The dynamo is of the Edison standard type. The capacity of the dynamo machine is 300 sixteen candle power lamps, while the feeders and mains of the wiring system are proportioned for 600 sixteen candle power lamps, which provides amply for the anticipated increase to 500 lamps of sixteen candle power, or 400 lamps of twenty candle power. Since the dynamo is expected to give almost continuous service, the belts are so arranged that power may be had from either the Corliss or high speed engine. The dynamo is also provided with a substantial brick and cement foundation surmounted by the wooden base frame necessary for insulation. On this wooden frame the side rails are securely bolted, the dynamo being held in position by its own weight in connection with the grooves into which the slide rails fit to keep pulleys in line.

The net weight of the dynamo is 2,880 pounds. The floor space occupied, 66x50 inches; the height above base of frame, four feet. The diameter of pulley, twelve inches; revolution of armature per minute, 1,400. The twenty-five horse-power required to drive armature when under full load is transmitted by a light double endless Schultz belt.

On the side wall, in position most convenient for the engineer, are found the regulator, the pressure indicator, the ampere meter and the ground detector.

—— F. T. Haskins, Town Clerk, Christchurch, New Zealand, notifies electric lighting contractors that tenders are wanted for the electric lighting of that place. Specifications and conditions can be seen at No. 7 Westminster Chambers, Victoria street, London, England. The competition closes on July 1st.

Washington, D. C.—The Washington Electric Railway Company.

Springfield, Ill.—The Inter Ocean Electric Company of Chicago. Capital, $100,000.

Columbus, O.—The Conneaut Electric Lighting Company. Capital stock, $10,000.

Cleveland, O.—The Buckeye Foundry Company, of Cleveland, Ohio. Capital stock, $100,000.

Hudson, N. Y.—The Hudson Electric Railway Co. Capital, $50,000. Hiram McGonigal, and others, incorporators.

Nashville, Tenn.—Gayner Electric Light Company, of Louisville, Ky., have contracted to put in the fire-alarm system.

New York City.—The Electric Light and Supply Co. has been incorporated. Capital, $10,000. Alfred R. Tong, and others, incorporators.

Pontiac, Mich. — The Edison Electric Light and Motor Power Co. has been incorporated. Capital, $12,000. Aaron Perry, and others, incorporators.

Milwaukee, Wis.—The Wisconsin Automatic Gas Company, of Milwaukee; capital, $250,000; incorporators, Orange Williams, Charles P. Foster and Albert A. Hoskins.

Tuskaloosa, Ala.—The Tuskaloosa Electric Light and Gas Company has been organized to erect an electric light plant. W. C. Harris, Jr., has the contract and will begin work on the plant at once.

Duluth, Minn—The Western Electric Supply Company. The object of the company is to supply electric light and power plants and machinery. A. L. Caxton is superintendent. Office of the company at Duluth.

Reno, Pa. — The Reno Manufacturing Company, the character and object of which is to manufacture articles of commerce from metal. The officers of the company are: J. H. Osmer, C. V. Culver, Jno. R. Penn, Jas. R. Adams, Walter R. Eaton.

Portland, Oregon.—The Metaline Transportation Company were filed with the county clerk yesterday by J. W. Troup, H. B. Borthwick and Thomas N. Strong. Capital stock, $50,000. The object of the company is to build railroads, canals, bridges, telegraph lines, etc.

Lawrence, Kan.—An electric light company has been organized here, with J. D. Bowersock at its head. A $30,000 plant is to be established, to include two engines of 200 horse-power each, and a dynamo, capacity of 70 arc 1,000 alternating incandescent lights. The Thomson-Houston system will be used.

Newark, N. J.—The Edison Phonograph Manufacturing Company was incorporated at the Essex County Court House in Newark, with a capital of $300,000 fully paid up. The incorporators are Thomas A. Edison and Alfred O. Tate and Charles Batchelor and John C. Tomlinson, of this city.

Johnson City, Tenn.—The Johnson City Electric Light Company have organized with J. J. Weiler as President; J. W. Thomas, vice-president; Frank Evans, secretary, and M. I. Gump, treasurer. They have ordered machinery for a 35-arc light plant. The Thompson-Houston system will be used.

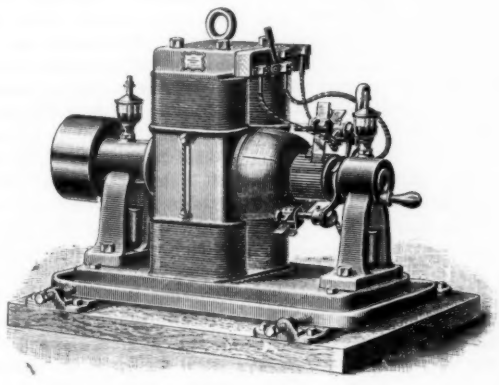
—— The Mingo Furnace Company of Salt Lake City, Utah, have just finished putting in a fifty horse-power Corliss engine, a pair of flange steel boilers of sixty horse-power each, and Westinghouse incandescent electric light plant, and a twenty-five horse-power Westinghouse engine.

Improvements in the Waterhouse System.

We illustrate the Waterhouse No. 1 dynamo which has recently had a number of minor improvements.

Slides having been provided having set screws for moving the dynamo and tightening the belt. The base has a deep groove for collecting any oil that would otherwise cover the wood foundation. A new brush holder has been adopted. The commutator is made of Billings drop-forged copper segments, and is very perfectly constructed.

We presented to the readers of the REVIEW a few weeks since the practical operation of the Waterhouse regulator, showing as lamps were cut out on the line the current in the machine was automatically reduced, but the current passing to the lamps was maintained at standard. This method of regulation applies to the small dynamos as well as the large machines, and produces an effect upon the current passing through the dynamo opposite to its natural tendency (to build up) and at the same time the dynamo is self-regulating, the automatic adjustment being attained without moving the brushes on the commutator.



NEW WATERHOUSE DYNAMO.

The Waterhouse small arc plants are therefore simple in construction, easily managed, and the dynamos are made for arc plants in sizes 3, 5, 10 and 12 lights, also 30, 50 and 100, 16 candle power incandescent lights.

Electric Heat Company.

The stockholders of the Electric Heat and Power Company of the United States held their first meeting on Saturday, April 28, at the Mountain View Hotel, Harper's Ferry, W. Va., and elected the following directors: Messrs. Caleb H. Jackson, James Atwell, George W. Wilson, J. H. Humbird, J. M. Guffey, of Pittsburgh, Pa., and George Hill, Jr., D. I. Murphy, Jules T. Demonet and F. W. Royce of this city. At the meeting of the board Mr. C. H. Jackson was elected president; Mr. F. W. Royce, vice-president; Mr. D. I. Murphy, secretary, and Mr. Geo. W. Wilson, treasurer.

Electric Motor Railway in Phila.

The Railroad Committee of the Council took up an ordinance providing for a practical test of the Rapid Transit Electric Railroad Company's motor. The bill provided that the consent of Councils shall be given to the use of Twenty-ninth street so far north of Norris street as it may be opened, for the purpose of demonstrating to Councils the practicability of the operarions of the electrical cars. Mr. Crawford Spear, on behalf of the company, made a brief statement of its intentions and claimed that this electrical system would largely do away with the demand for elevated railroads. On Mr. Freeman's motion, the bill was amended so that the tracks shall be laid north of Diamond street, in order to avoid the necessity of tearing up Twenty-ninth street, between Norris and Diamond. A clause was added requiring that security in the sum of $10,000 shall be given in order to bind the company to restore the street to its original condition should the road be abandoned. With these amendments it was agreed to report the bill favorably.

—— The Birmingham Safe & Lock Co., of Birmingham, Ala., will erect an electric light plant.

The Next Convention August 29th.

THE DATE OF THE NEW YORK MEETING OF THE ELECTRIC LIGHT ASSOCIATION—FULL REPORT OF THE EXECUTIVE COMMITTEE MEETING AT THE ELECTRIC CLUB.

The Executive Committee of the National Electric Light Association met in the parlors of the Electric Club, Thursday evening, May 3d.

The gentlemen present were S. A. Duncan, of Pittsburgh, president of the association; A. J. De Camp, of Philadelphia, vice-president; W. H. Harding, of Baltimore, secretary and treasurer; Dr. Otto A. Moses, of New York, chairman of the committee; and Messrs. J. F. Morrison, of Baltimore; Frank Ridlon, of Boston, and E. F. Peck, of Brooklyn.

The treasurer's report showed the association to be in an excellent financial condition. The printed volumes of the proceedings of the association for the past two years, which are being printed by *Modern Light and Heat*, of Boston, will soon be issued.

It was voted that fifty volumes be printed in extra binding for sending abroad, and for sale to those of the members who desired them.

The secretary was requested to write to all the chairmen of committees appointed at the Pittsburgh convention, with a view to learning what progress had been made with the subject of each committee, and to urge prompt action in the premises.

It was decided to begin the next meeting of the association on Wednesday, August 29th, to continue three days. The Hotel Brunswick was selected for the place of meeting, the best terms and most conveniences being offered by the managers of this hotel.

Gen. C. H. Barney, secretary of the National Telephone Association, was present, and stated that his association would meet in this city on the following week, and would probably begin its sessions Monday, September 3d.

A general discussion followed relating to the matter of an understanding with the insurance people, by which certificates showing the standing of employés of electrical companies could be issued by the association, somewhat on the plan proposed by the Electric Exchange of Boston. On motion of Mr. Morrison, it was voted to appoint a committee, composed of Dr. Moses, of New York, A. J. De Camp, of Philadelphia, and Frank Ridlon, of Boston, to prepare a detailed plan for carrying out this idea, and report it at the next meeting of the committee, with the view of presenting it to the association at the August meeting.

The question of the danger of electric light circuits, which had been so greatly exaggerated in the daily press of this city, was discussed at some length.

Mr. Morrison stated it as his unqualified belief that nine-tenths of the accidents from electric light wires had resulted from the dead wires of other wire companies that had never been removed. These wires were under no one's especial care. If an electric light line in the air was properly constructed and dead wires of other companies removed, there would not be any danger at all. As far as his city (Baltimore) was concerned, he was glad to say that he never had any trouble. The Chesapeake & Potomac Telephone Company he mentioned as being particularly careful in this respect.

The secretary stated that during the past ten years, the period of the existence of the electric light, there had been less than fifty fatal accidents, and in nearly every case the carelessness of the victim was the cause of the accident.

Dr. Moses stated his belief that the dead wires were the cause of the trouble. These wires, as he had before stated, and had been misquoted in the daily press, were a menace to the lives of the people, and should every one be removed. A line properly constructed and closely looked after, brought no danger at all. It was only the carelessly left foreign wires that brought about the risk for which the electric light companies had to bear the blame.

President Duncan, Messrs. Ridlon and De Camp, all agreed with this view of the situation.

The interesting fact developed in the discussion of this question, is the statements of Messrs. Morrison, Peck and Duncan, that the noises caused by the electric light wires and electric motor wires, which had at first apparently annoyed telephone subscribers, did not any more disturb the telephone user. He had become accustomed to the inductive effects, and soon discovering that they did not interfere with his conversing, had promptly stopped objecting. Dr. Moses said this inductive effect could be looked upon as a pleasant means of concentrating the attention.

Numerous instances of the changes that had come about in this respect were recited, several of which were amusing as well as instructive. A stock ticker, with its irregular sounds, had been found to be much more annoying and preventive of telephonic conversation than the steady sound caused by induction from electric light or electric power currents.

The committee after considering the matter of addresses for the coming convention, and deciding to leave it chiefly in the hands of Dr. Moses, the chairman, adjourned to meet at the call of the chairman in about sixty days.

Before going into session the committee and a number of other members of the Electric Club enjoyed a dinner together, some forty in all being present. The occasion was a very pleasant one, and the members of the committee seemed particularly pleased with the conveniences thoughtfully tendered them by the Club.

Electricity is Cheaper Than Gas.

In response to a resolution, the architect of the Capitol has informed the House that the Capitol can be lighted by electricity at an annual cost of about $16,000, or something less than the cost of lighting by gas, as at present. He believes it advisable to light certain parts of the building in this way, for the reason that the electric light does not vitiate the atmosphere or heat the building. He submits bids from the United States Electric Company, of New York; the Sawyer-Man Company, of New York, and the United States Electric Lighting Company, of Washington, for supplying a suitable plant for lighting the Capitol. The bids range from $100,000 to $130,000.

—— Otto A. Moses, the well-known expert electrician of New York, was in the city last week to inspect and test the new electric meter made by the Westinghouse Company, and pronounces it a perfect success. It is intended to show the amount of electricity consumed by the users of the alternating current in number of hours of consumption, amount in candle light units and amount due in dollars and cents, so set forth that every man can read and keep his own electricity account. He pronounces them more reliable than any gas meter, and they will be largely manufactured and put into use at once. Although meters for continuous currents have been in use, this is the first ever made for an alternating system.—*Pittsburgh Post.*

ELECTRICAL REVIEW

Published at 13 Park Row
P. O. BOX 3329.

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REGISTERED CABLE ADDRESS:
"ELECTVIEW," NEW YORK.
TELEPHONE CALL, 546 JOHN.

SUBSCRIPTION.

United States and Canada, $3.00 per annum, in advance. Postage paid by publisher.
Great Britain and other foreign countries, $4.00, in advance. Postage paid by publisher.

ADVERTISING.

Transient, 25 cents per line, nonpareil.

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The Western News Company, Chicago, Ill.
The Williamsburgh News Co., Brooklyn, E.D., N. Y.

EDITORIAL ANNOUNCEMENT

Address all communications and make all Express Money orders, P. O. orders and checks payable to order of ELECTRICAL REVIEW. P. O. Box 3329, New York.

☞ No attention will be paid to communications without the *name and address of the writer.*

We invite correspondence from Electricians, Inventors, and the Telegraph and Telephone fraternity and those engaged in Electric Lighting, on matters pertaining to electrical and scientific subjects, and all facts of special interest in connection therewith.

We extend to manufacturers of electrical apparatus an invitation to send to this office any and all facts concerning their business which will be of interest to the public. We make no charge for publishing news.

Subscribers can at any time have the mailing address of their paper changed by sending both old and new address.

Timothy W. Sprague, Massachusetts Institute of Technology, is our representative at Boston, Mass.

Mr. C. C. Haskins, 118 La Salle Street, Chicago, Ill., represents the REVIEW in the West.

NEW YORK, MAY 12, 1888.

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We have some more electrical novelties in store for our readers.

The beautiful simplicity of Tesla's invention commends it, and gives birth to the inevitable thought: Why did not somebody think of that long ago?

There will be no more fifty cent gas in Baltimore. The two big rival companies have decided to unite, and the price set by the legislature, $1.25 a thousand, will be charged hereafter.

August and September will be electrical months in this city. The Electric Light and Telephone Associations convene here on consecutive weeks, and will comprise two notable and important gatherings.

The Tesla motor for alternating currents is another step in the onward march of electrical progress which is ever active. It will continue, and discoveries will be made in the future as in the past, in the forms and production of this most wonderful of all nature's handiwork.

The Electrician, London, issues as a supplement to its edition of April 27th, a most excellent engraving of Sir John Pender, K. C. M. G. Sir John has won renown in telegraphic and ocean cable circles, his personal energy and commercial credit being strong factors in the success of the Atlantic cable.

There will be a large attendance of Electric Club members at the special meeting Saturday night of this week to hear Mr. E. T. Gilliland's address on the Phonograph. The meeting is for members of the club only, and will be the occasion of the first general exhibition of this interesting and promising invention. Every member who possibly can should be present.

The *Progressive Age*, one of our highly esteemed contempories, has become a semi-monthly instead of monthly and has moved its publication office from Philadelphia to New York. The *Age* is a progessive and interesting journal devoted broadly to the gas interests of the country. It is now in its sixth year and its appearance gives every indication of the prosperity that it so thoroughly deserves.

The Oerlikon Works, in Switzerland, are negotiating with a large manufacturer in Milan, for an electric plant capable of transmitting 250 horse-power to a distance of about 2,200 feet, with a guaranteed efficiency of 78 per cent. The motive power will be Turbine water-wheels, which will drive two Oerlikon dynamos, and the current will be transmitted to two motors of the same make by three conductors, as in the Kriegstetten installation, lately illustrated in the REVIEW.

The *World* of Monday makes a slight mistake in saying the Field motor had not been successful on the elevated railways. It was, on the contrary, a very complete demonstration of the adaptability of electrical energy as the motive power for these railways; but there were then, and are to-day, influences at work, and wheels within wheels, and signs and grips, which forbade the adoption of the new agency which would knock out the steam motors and curtail the consumption of coal.

Electric Light Association matters start off most promisingly. The meeting of the Executive Committee at the Electric Club, last week, was a very satisfactory one, and the groundwork planned for an interesting and instructive convention in this city, commencing August 29th. There will be a number of able addresses delivered by gentlemen eminent in the arts and sciences, as well as the presentation of the latest advances in practical and scientific work relating to electric lighting and the application of electric power. We think there will be a number of important improvements to discuss.

THE COAGULATED AND EXALTED GALL OF A TELEPHONE BORROWER.

A well known telephone general manager resides in Brooklyn, and of course has neighbors. One of these, a next-door neighbor, soon discovered the conveniences of a telephone for which no rental had to be paid, and presuming on a slight acquaintance and a neighborly feeling, became a very regular user of the said general manager's instrument. Through sickness, through the blizzard, night time and day time, the favor of telephone service was asked and not refused; the servant came in and ordered groceries, and coal, and meat; the doctor was telephoned for; and the telephone was the means of saving said neighbor from starving during the blizzard, and from freezing when his coal supply was exhausted.

The general manager went away for a month.

Then the neighbor's opportunity came.

Possessed of a stock of the milk of human kindness and generous appreciation of favors received, he visited the general offices of the telephone company, and indignantly ordered that the wire running to the telephone that he had been borrowing the use of for so many months, and which happened to be fastened to a corner of his roof, be instantly *removed*. His request was complied with promptly, although two messenger-call wires are still attached to his house.

The surprise of the telephone general manager upon his return to hear of this action of his neighbor, can be imagined.

It is but another proof of the queer streak in the mental make-up of human beings that the telephone has brought to the surface, which is, that the more one receives in direct benefits from the use of the instrument, the more emphatic he is in denouncing it, and in throwing obstacles in the way of perfect service.

Will some of our philosophers explain this?

OUR CHICAGO LETTER.

(Special Correspondence.)

Mayor Roche the other day requested the officers of the Chicago Telephone Company to furnish him a complete list of all telephone subscribers who desire to move May 1. The Council has refused to allow the telephone company to remove the wires for such subscribers, and the Mayor proposes to assume the responsibility of accommodating such persons himself. The city will itself remove the wires for the subscibers and charge the cost to the telephone company.

Duluth, Minn., has a fire alarm system, and has also an electric light plant, and recently had a misunderstanding which resulted in effectually cleaning up an alarm box. The dynamo was uninjured.

The regular meeting of the Electric Club, this evening, will be the occasion of the reading of the fifth paper on the alternating and continuous current systems, by Mr. George Cutter, of the Thomson-Houston Company. Mr. Cutter will advocate the side of the alternate currrent, which he considers unlimited in its capacity of adaptation and usefulness, while the continuous current is to a greater extent limited in its range of applicability.

Motors are beginning to be more generally introduced, now that these are placed either on independent circuits, or allowed on strictly isolated plants.

The Arc Light and Power Company a short time ago arranged for a power circuit, on which it places no lamps. Now, it is considerable of an undertaking to run a wire so as to hit every location where a motor is needed in a city, the business portion of which covers as much territory as Chicago.

The results, however, have been remarkably satisfactory, and while some parties have not been reached, up to date, the power circuit is now busy on fans, printing presses, shirts, pantaloons, lathes, coffee mills, etc., and is doing well. We have the Baxter, C. & C., Sprague and one poor little thing of doubtful parentage, an orphan without pedigree or name, and hardly any sphere of usefulness. It is one of those things like Topsy, that growed, and it is wasting its sweetness in a close, hot room, where entrance is tabooed save to unsavory smells, the owner and the electric light inspector. An electrical diagnosis of its case pronounces the "little hindering thing" consumptive, and it will probably go out with the tide some day, when the weather gets a little warmer.

Chicago, May 7, 1888. C. C. H.

OUR BOSTON LETTER.

(Special Correspondence.)

The Electric Club will hold a regular monthly meeting this evening, when arrangements will be made for a proper celebration of the club's anniversary, which occurs in June. As has been previously reported, Mr. A. H. Chapman has found it necessary, from a press of other duties, to resign as chairman of the House and Entertainment Committee, and at a meeting of the committee Friday evening, Mr. H. B. Cram was elected to fill the vacancy. It has been arranged to hold "smoke talks" at the club rooms weekly, and a weekly paper, by members of the club, is also one of the probabilities.

The Davis & Furber Machine Company of North Andover, Mass., have contracted to light their new Card Clothing Factory with the Loomis Incandescent System.

Mr. George W. Davenport, of the Thomson-Houston Company, has been confined to his house for over a week by illness. He is now convalescing, however, and it is hoped a few days will see him back at his accustomed desk.

The propelling of boats by electricity is receiving quite a boom in this vicinity. The Electric Accumulator Company is in daily receipt of many inquiries of this nature, and has just installed an accumulator plant, to be used with a small Sprague motor, in a rowboat at Attleboro', Mass., belonging to H. K. Sturdy. The same company has also fitted the beautiful new yacht "Sagamore," belonging to John W. Streeter, with an accumulator plant, to be used in connection with the Edison system of incandescent lighting. The yacht was built by the New England Ship Building Company, and is shortly to start on a cruise around the world.

Mr. W. H. Knight, of the Bentley-Knight Company, was a Boston visitor last week.

It is rumored that the C. & C. Motor Company is shortly to establish an agency in Boston. It will have a prolific field of work.

Mr. Coffin, of the Thomson-Houston Company, has just returned from his short period of well-earned rest at the South.

The Baxter Motor agency has been doing a good business in Maine during the past few weeks.

The Thomson-Houston Electric Company report the following new plants: Johnson City, Tenn., 30 arcs; Oswego, Kan., 30 arcs; Hall & Buell, Chicago, Ill., isolated plant, 50 incandescents; Conneaut, Ohio, 400 incandescents; Tan-Optician Building, Ohio, isolated plant, 500 incandescents; Wahpeton, Dak., 500 incandescents; Hastings, Minn., 500 incandescents; Pella, Iowa, 500 incandescents. Also the following increases: Columbus, Ohio, 41 arcs; Owego, N. Y., 30 arcs.

Some important conferences were held last week between the electric street-car men and the West End officials, and developments may be expected within a few days.

The conduit matters and elevated road question have retired into temporary seclusion, but may be expected to "bob up serenely" at any moment. T. W. S.

Boston, May 7, 1888.

THE LATEST WONDER—IMPROVED LAMP FILAMENT.

A special despatch from Pittsburgh, May 4, says:

"M. De Routhowsky, Secretary of the Russian Legation, was in the city Tuesday, and spent several hours in consultation with George Westinghouse, Jr., and other members of the Allegheny County Electric Light Company. In explanation of his errand he said: 'I come here on behalf of a fellow-countryman for whom I have just concluded an important contract with Mr. Westinghouse relating to incandescent electric lamps. My countryman has discovered a filament to be used in incandescent lamps that is capable of standing so high a temperature that from two to four times as much light can be secured from a given expenditure of power as has been claimed by the Westinghouse and Edison companies. The lamps which are supplied with these filaments will give more light for the horse-power than two arc lamps. I think the effect, when this invention is adopted on electric lighting will be very marked, as it will double the capacity of existing plants and will save ten per cent. in fuel, which has all along been about one-third of the cost of operating.'"

Annual Report of the New England Telephone and Telegraph Company.

President Sherwin, of the above company, under date of May 7th, 1888, says:

Your Directors submit herewith a report of the operations of the company for the year ending December 31, 1887. As shown by the treasurer's statement appended, the

Gross earnings for the year were	$1,011,836 53
Expenses	727,184 92
Net earnings	284,651 61

As compared with the results for 1886, there was an

Increase of gross earnings	$92,726 89
Increase of expenses	67,489 03
Increase of net earnings	25,237 86

While there has been a gratifying increase in every class of revenue except telegraph commissions, the increase of expenses, notably in the items of taxes, repair and reconstruction, and operating, has been proportionately great. The large expenditures upon maintenance and improvement of the property and in perfecting the service of the operating department, has without doubt been fully compensated for by the enhanced value of the plant, the general immunity which we have had from damage and interruption by storm, and the greater satisfaction which our subscribers have found in making use of the facilities which our system affords.

The increase in instrument rental account results from the large gain in the number of subscribers, and a corresponding increase in the number of telephones and transmitters required.

Dividends were paid during the year to the amount of $259,413.75.

The work of reconstruction, of strengthening and resetting lines, and substituting improved apparatus in place of that which, even with but few years of use, has come to be regarded as antiquated and unsuited to modern requirements, has been vigorously pushed.

Following is a condensed statement of the construction and reconstruction for the year:

In the exchanges of the Eastern division, at Bangor, Portland, Rockland and Waterville, poles have been set to the number of 127, 8 miles of iron wire and 1,139 feet of cable hung.

In the Western division, in the exchanges of Athol, Bellows Falls, Burlington, Clinton, Fitchburg, Holliston, Holyoke, Pittsfield, Springfield, Westfield, Winchendon and Worcester, 1,659 poles have been set, 148 miles of iron, and 70 miles of copper wire strung.

In the exchanges of Amesbury, Dover, Gloucester, Haverhill Lawrence, Lowell, Lynn, Nashua, Portsmouth and Salem, of the Central division, 414 poles have been set, 151 miles of iron and 56 miles of copper wire, and 4,247 feet of cable hung.

In the Suburban division, embracing the exchanges at Brookline, Cambridge, Canton, Charlestown, Chelsea, Dorchester, East Boston, Hyde Park, Jamaica Plain, Malden, Medford, Milton, Newton, Newtonville, Quincy, Somerville, Waltham and Woburn, 1,340 poles, 354 miles of iron and 107 miles of copper wire, and 8,136 feet of cable have been used.

In the Boston exchange 81 poles have been set, 1 mile of iron and 18 miles of copper wire strung, 40,157 feet of aerial and underground cable, and 1,610 feet of submarine cable have been put into use.

Additional underground conduits have been laid in Boston as follows:

On Tremont street, from West Newton to Ruggles street, 4,280 feet.

In Exchange street, Dock Square, Union, Hanover, Endicott, Cooper, Beverly, Brattle, Court and Cambridge streets, 6,000 feet, making a total of 10,280 feet of 9 duct conduit laid during the year.

Of the 41,767 feet of cable used in Boston the following has been drawn into conduits and is now giving satisfactory service:

1,589 feet, 200 conductors; 12,804 feet, 100 conductors; 6,567 feet, 80 conductors; 2,796 feet, 50 conductors.

Of sub-marine cable there has been laid:

360 feet, 50 conductors; 625 feet, 25 conductors; 625 feet, 2 conductors.

Of aerial cable there has been hung:

8,695 feet, 100 conductors; 5,516 feet, 50 conductors; 1,415 feet, 38 conductors; 775 feet, 25 conductors.

The total length of wire laid underground during the year is 476 miles. The total length of conduit now owned by the company is 22,310 feet, capable of carrying 5,000 miles of wire, in which 823 miles of wire are now working successfully.

The company has now in use 219,840 feet of cable carrying about 2,639 miles of copper wire, nearly one-third of which is underground.

In the inventory of supplies used during the year are included 2,000 backboards and batteries, 900 magneto and 175 extension bells, 10,000 cords, 7,000 cross-arms, 3,621 poles, 55,289 feet of cable, 913 miles of wire, 68,000 insulators, 57,000 oak pins and brackets, 3,000 strong current protectors, with much other material of various description. 3,433 magneto bells have been refitted at a cost of $9,600.00. The total expenditure for material purchased has been $104,000.00.

The exchange at Cambridge has been equipped with a new multiple switchboard; those at Amesbury, Brookline, Charlestown, Concord, Mass., East Boston, Jamaica Plain, Malden, Pittsfield and Somerville, with new boards, in most cases of the Standard Electric pattern. The boards at Hyde Park, Medford, Portsmouth, Walpole and Waltham, have been rebuilt. The increase of subscribers in the Pearl and Tremont street offices, at Boston, has rendered necessary the addition of new sections of multiple boards at those points.

Of the Exchanges operated by the Company, 67 have, since October, 1883, been equipped with new boards, or with those rebuilt and adapted to modern requirements.

Several new multiple boards have been contracted for, and within the present year the exchanges at Lynn, Lowell, Roxbury, Salem, Springfield, Worcester and, perhaps, others of our principal offices, will be refitted upon this system, now generally regarded as the one best adapted to the work of large and busy exchanges. * * * * * * *

The expenditure upon the plant and equipment during the year has been:

For Construction	$24,277.05
For Reconstruction	46,987.79
For Repairs and Maintenance	159,553.35
	$230,818.19

as against an expenditure for 1886 of $224,734.54

The mileage of exchange wires December 31st, 1887, was:

On poles	10,802 miles.
On buildings	2,269 "
Underground	823 "
Sub-marine	50 "
Total	13,944 "
An increase of	1,641 "

	Dec. 31, 1886.	Dec. 31, 1887.	Inc.
Exchange subscribers	13,007	14,240	1,233
Express "	518	547	29
Private line and agency contracts	2,680	2,569	Dec. 111
Total stations	16,205	17,356	Net In. 1,151

The increase in number of stations during 1886 was 679.

To effect the net increase of 1,262 in the number of exchange and express subscribers, shown by the foregoing statement,

New subscribers have been connected	3,567
Subscribers have been disconnected	2,305
	1,262

The extra-territorial lines number	73
Miles of extra-territorial pole lines	2,109
Miles of extra-territorial wire	3,511
Number of regular employés of all classes	520

The average number of local exchange connections daily, in all the exchanges of the company, is 62,990, or an aggregate for the year of 22,991,350.

The average number of calls per subscriber daily is 4½, the number varying from 2¾ in the smaller exchanges, to 8 in the Pearl street office at Boston.

The daily average of extra territorial and toll messages is 1,450, a yearly aggregate of 529,250.

In June of last year, Messrs. Jasper N. Keller, general manager, and David B. Parker, superintendent of the Boston division, both efficient and valued officers, resigned to accept positions in other lines of business. Assistant General Manager W. J. Denver was appointed to the office vacated by Mr. Keller, with Messrs. J. W. Duxbury and F. A. Houston as his assistants, the latter also holding the position of attorney for the company. Mr. Clarence A. Perkins, formerly engineer in the Boston Exchange, was appointed manager of that Exchange, and Mr. George E. Hanson, superintendent of the suburban division. With these exceptions, the general apportionment of duties remains unchanged.

The company has a well organized corps of officials throughout its various departments, and both in the line and operating departments a disposition is manifest to maintain a high standard of excellence and render the service of larger value to the subscribers. The large increase in the number of stations operated, and the increasing average use of the service made by subscribers, are indications that we are accomplishing this result.

In the Auditor's department progress has been made towards perfecting the system of accounts adopted during the previous year. All bills for rentals are now issued from the general office at Boston, and, so far as practicable, the work of accounting has been transferred from the divisions and exchanges to that office, thus leaving the superintendents and managers more free to devote their attention to the practical work assigned to their charge. The special examiner has made a thorough audit, during the year, of the books at 61 of the exchanges, discovering and adjusting such errors as existed, and bringing the accounts of those offices into accord, both as regards method and fact, with the books of the Auditor's office.

The electrician has continued his work of making galvanometer tests and measurements. A new set of instruments has been purchased for his use, by which accurate measurements can be made of cables, for resistance and capacity, and electrical troubles more readily detected. Several exchanges have been furnished with strong current protectors during the year. The principle offices have also been equipped with thermostats for the detection of fires, and all exchanges are now supplied with some appliances for extinguishing fire.

Patents for Mr. Farnham's inventions of the wax protector, and the low resistance relay for use in switchboards, have been issued to the company. Applications for patents for an improved form of pulverized carbon transmitter, and for cable testing device, have been applied for.

There has been no legislation since the date of the last report, in any of the states in which the company operates, which affects its interests. An abortive attempt has been made this year, to secure the passage by the Legislature of Massachusetts, of a bill to regulate telephone rates. The movement had no support. The experience of previous years has shown that the most determined and effective opposition to legislation of this nature has come from the subscribers, who recognize the fact that, with fair rates, graduated according to the size of the exchange and importance of the service, from which the company can realize a moderate return upon its invested capital, and at the same time have the means for securing improved appliances, retaining competent employés, and thus keeping the service at a high degree of efficiency, the balance is in their favor. Hampered by restrictive rate laws, the service would inevitably deteriorate, and the interests of the subscribers which are closely allied to those of the company, would suffer.

Your directors are glad to report that the year has proved one of prosperity to the company, and of progress in all directions—in the growth and development of its business, the increase of revenue, the improvement of its property, and the bettering of service afforded to subscribers.

The company's exchanges and long lines are in better condition than ever before. The property has suffered less than in any previous year from damage by storm, and is generally in a condition to withstand any weather except tempests or sleet of unusual severity. Reconstruction of the outside property has been of the most substantial character.

While your directors have been conservative as regards charges against the construction account, it has been their policy to adopt and place in use the improved forms of switchboard, cable, and other apparatus at important points, as fast as changes could be made without undue sacrifice of the existing property and too great disturbance of the service. More work of the same nature remains to be done, part of which is already in progress.

With the increasing demand of the public for rapid and trustworthy service, it is clearly for the interest of the company, and essential to the maintaining of its present satisfactory relations with its subscribers, that it keep abreast with the progress of the art, adopting, from time to time, such approved methods and appliances as will tend to perfect the service, even at the considerable outlay involved.

Inventions of devices for use with the telephone are almost without number, many of which do not bear the test of practical application. How soon the apparatus, now the most approved, will be superseded by other, of later and more effective design, no one can venture to predict, but it is not unlikely that, within a few years, the equipment of our large exchanges will be essentially different in form and character from that which we are now employing.

The new year has opened with a continuance of growth, and there is every indication that the profits from the business will equal those of the past year.

The following is an estimate of the cost of maintaining and extending the plant for the year 1888:

For construction	$80,000 00
For reconstruction	52,000 00
For repairs	160,000 00
	$292,000 00

Respectfully submitted for the directors.

LEDGER BALANCES, Dec. 31, 1887.

DEBTORS.

Licenses	$4,268,000 00
Plant	6,164,331 35
Unissued stock	1,605,400 00
Trustees' "	231,000 00
Construction (for the year 1887)	24,277 05
Office furniture, teams and tools	18,331 40
Bells, material and supplies	143,686 55
Accounts receivable	94,199 21
Cash	54,135 94

CREDITORS.

Capital stock	$12,000,000 00
Surplus account	369,790 42
Income "	127,151 61
Reserve accounts	88,662 11
Bills and accounts payable	17,757 34
	$12,603,361 48

Net loss of agency subscribers for the year 1887	111
Net gain of exchange subscribers for the year 1887	1,262

WM. R. DRIVER, *Treasurer.*

The Electric Club.

STARTING THE NEW FISCAL YEAR WITH FINE PROSPECTS—MEETING OF THE BOARD OF MANAGERS—HOUSE COMMITTEE APPOINTED—GENERAL NOTES.

The Electric Club, of this city, gives every indication of becoming a national scientific-social institution. Its increasing roll of membership, the delightful club-house that has become so popular, and the zeal and earnestness of the managers, are elements that insure unqualified success. Every visitor is surprised to find that the electrical interests, comparatively so young, should have been able to secure such a well-apportioned and comfortable home in this great city.

A well attended meeting of the newly-elected Board of Managers was held Tuesday evening of last week, among the gentlemen present being Messrs. H. C. Davis, E. T. Gilliland, O. E. Madden, Willard L. Candee, Chas. W. Price, John C. Tomlinson, A. H. Patterson, Chas. W. Gould, Geo. B. Coggeshall, Cyrus O. Baker, Jr., H. A. Reed, J. N. Keller, Henry D. Stanley, M. W. Goodyear.

The following-named gentlemen were unanimously elected members of the House Committee: Theo. N. Vail, H. L. Storke, Cyrus O. Baker, Jr., John C. Tomlinson, A. H. Patterson; and after discussing the bright outlook and suggesting plans for the future, the Board adjourned for one week.

ELECTRIC CLUB NOTES.

Mr. Frank Ridlon, of Boston, occupied a suite of rooms at the Club several days last week.

Mr. J. A. Powers, of Troy, N. Y., one of the early Club members, was a visitor last Tuesday.

Charles Warren Lippett, a Providence member, was a Club guest a few days last week.

The storage battery plant at the Club is a point of much interest, and many visitors request the privilege of seeing it.

Captain E. L. Zalinski, U. S. A., is being congratulated by a number of his fellow-members of the Club over the success of the recent tests with his dynamite gun.

The address on "The Phonograph" and the exhibition of the instruments will be given at the Club, Saturday evening, May 12, beginning at 8 o'clock. This will undoubtedly be a most interesting occasion.

Mr. J. F. Morrison, former president of the National Electric Light Association, came over from Baltimore last week and paid his first visit to the new Club House, and was, of course, greatly pleased with the handsome rooms. "It is one of the prettiest places I ever saw, particularly the parlors," was his comment.

In this Club, as in all clubs, the House Committee is the important committee. The House Committee, during the past year, has done a great deal of hard work, under the many disadvantages of getting into a new house, and its members were no doubt glad to be relieved. The new House Committee is a particularly strong one, and with the exception of Mr. Baker, are all newly elected.

TELEGRAPHIC

.... Rockland, Me., is putting in a new fire alarm system.

.... The Rocky Mountain telegraph has established night service at Helena, Montana.

.... Derby, Conn., is pleased with its new electric road, which cost $75,000. The trial trip was quite successful.

.... The Spanish Government is in treaty with a foreign company for the establishment of a telegraph cable between Spain and the Balearic Islands.

.... The day the Emperor died there were sent off from the Berlin telegraph office 29,878 messages, aggregating 799,926 words. On the following day this record was beaten with 36,615 messages, aggregating 1,115,55i words.

.... A signal service station, to be supplied with self-registering apparatus throughout, will be established at Port Eads, La., by Signal Officer Kerkam, shortly. The value of a station at that point, especially during July, August and September (the hurricane months), is inestimable. The observer in charge at Port Eads will make telegraphic reports to the signal office in New Orleans twice daily.

.... A recent decision of the Treasury Department is to the effect that old copper wire imported for the purpose of being brazed, run through the drawing machine and exported, does not come within the provision in Section 2507 of the Revised Statutes, authorizing the importation in bond of machinery for repair, but may be entered for exportation (after remanufacture) with benefit of drawback, under Section 3019 of the Revised Statutes.

.... A lightning storm set in at Saratoga last week early in the evening and continued until one A. M. Lightning struck several buildings, causing slight fires. The cupola of the Western Union Telegraph Company, in the Arcade building, was also set on fire by lightning, and completely destroyed. It will require weeks of labor to replace the wires in position again. The Western Union Telegraph Company for one night had no connection with any other office. The loss will be heavy.

.... Mr. John Baker, of Illinois, has presented in the House a petition signed by 1,645 of his constituents in favor of a system of Government telegraphy. Discussing the object petitioned for, Mr. Baker said it was only a question of time, and he thought not a very long time either, when the telegraph would become an adjunct of the Government postal system. He added that a great number of petitions similar to the one he presented to-day had been sent to members of Congress from all sections of the United States, signed altogether by an immense number of people. He regards this as one of several great movements in the direction of releasing the mass of the people from undue domination by corporate power in the hands of a few.

A Close Call for Edison's Laboratory.

Quite recently Thomas A. Edison's laboratory at Orange, N. J., had a narrow escape from destruction. The man in charge of the blacksmith shop had occasion to leave the place for a moment, and when he returned he found the floor ablaze. Quickly summoning aid he hastened to get the hose which is kept on the premises, into working order, and in a few minutes a copious stream was pouring on the flames. The fire did about $200 damage.

It is thought that the fire was caused by a spark on the floor. Had not the blacksmith returned at the time he did the flames would have gained great headway, and the immense laboratory would have been endangered.

The Question of Patent Office Changes.

To the Editor of Electrical Review:

The effort of the National Electric Light Association to reform the patent system is a move in the right direction, though the time seems to be inopportune for the serious consideration of any subject by Congress. The ordinary congressman has too much to do just at present in placing himself right with his constituents to consider any question on its merits merely. It is the season for mending fences. The election is too near and the parties have enough to attend to in considering questions of tariff and currency without devoting any serious thought to the patent system.

It is a great pity that the patent system is not better understood and its advantages more thoroughly appreciated by those who have the making of our laws. Through the stimulus afforded by our patent system there are called into existence in each year some 25,000 properties of greater or less value—more of them unfortunately of less value than greater—but each advancing in some slight degree, the art to which it appertains. The value of one of these patents may not be apparent at first. The full capabilities of the machine or art which it describes may not be entirely understood. All the more reason why men of the highest intelligence should have to do with the creation of the grant, in order that they may assist in procuring for the ultimate benefit of the public the fullest possible disclosure of the invention, and also may prevent the public from being humbugged by the issue of a patent for a combination which does not merit the name of invention.

The officials who make the examination of questions of novelty in the patent office, stand between the public on the one hand, and the inventor on the other, and have duties towards each, which require great impartiality and skill in their performance. There should be some standard by which all so-called inventions should be gauged. There should be a systematic consideration of all questions arising, and the law of the land as laid down by the courts, should also be the law of the patent office, in fact as well as in theory, so that the inventions of a man who designs fancy looms should be given the same consideration, whether much or little, as the inventions of a man who designs stocking supporters and suspenders. The same strictness as well as liberality should prevail in the one case as the other, whether the new thing be a machine for rolling gears or a safety pin. In either case, if the invention be of value, the day will come when a court will say: "Does this patented thing show invention as distinguished from mechanical or technical skill?" "Is this an example of the exercise of ingenuity, or is it merely the result of the judgment of a skilled workman?" And the court will proceed to answer those questions by the light of such analagous sets of circumstances as have already furnished material for previous decisions.

Why should not the same rules be applied with the same care by men as carefully trained to their work when the new device is under consideration in the patent office? To decide these questions properly requires an intimate knowledge of the decisions of the courts, as well as facility in handling such questions of mechanics as may arise, and for that reason, it is necessary that for the most consistent granting of patents there should be an appellate tribunal of highest resort having jurisdiction of such matters, which tribunal should be practically permanent in character, and easily accessible to all parties concerned in cases of sufficient importance and which should be mentally competent to formulate the law as declared in patent litigation, and apply it as occasion arises.

Two features in the bill of the National Electric Light Association are aimed at the establishment of such a status first, the appointment of a Court of Patent Appeals to have appellate jurisdiction "from the commissioner of patents in all cases touching patentability of inventions, priority of invention among several claimants for patents upon the same invention, and the judicial practice of the patent office, etc.; and, second, the appointment of a commissioner of patents who shall hold office for six years from the date of his appointment." The court as proposed, is to consist of a chief justice and four associate justices each of of whom, with the commissioner of patents, is to receive a salary of 8,000 a year.

This court is also to stand as an intermediate court of appeal from the circuit courts in order to relieve the Supreme Court of the United States of some of its work.

This prosposed court may answer the required purpose. It is certainly very desirable that a practically permanent body should exist in the patent office or out of it, which should have an eye to the practice in the office and be in a position to correct abuses when they exist. But this is not the bottom of the trouble. The patent office itself should be a place where the possibility for abuses should be reduced to the minimum. This cannot be when the office has so few employés, comparatively speaking, to do the enormous amount of work to be done. The $50,000 which it is proposed to spend on this Court of Appeals, could be used to better advantage in the patent office itself, than outside. As to the work which such a court as the bill proposes is to undertake as a court of appeal from the circuit courts, unless the number of appealed cases is materially increased, the Court of Patent Appeals would not find very much to do in this line. Say twenty-five cases a year would be their average work. To be sure the fact that a party could have his case heard on appeal within a year say of the date, when the decision is rendered in the lower court, might prove an inducement to him to try his luck, where under present circumstances the three years and more delay would be so discouraging, that he would not risk the effect on his business.

To meet this end, the Davis bill was proposed some four or five years ago, and the present bill No. 8,140 of the House of Representatives has been introduced relating to the jurisdiction of the United States Courts. This last bill, if modified in some points, will undoubtedly hasten the hearing of appealed cases and except that the court will have no such control of the practice of the patent office as the modified Court of Patent Appeals, it will in many respects answer the objections of the framers of the bill under consideration.

However, the only question for us is that of the expediency of forcing the consideration of the present bill at the present time. Six positions to be filled, five of them for life with a salary attached, handsome as salaries go, would be tempting bait to some of our political friends. The establishment of these positions on the eve of such an election as that of next fall is likely to be, would afford great temptation for the reward of political friends and the payment of political debts by a corrupt administration, and however consistent the rulings of that court might be, there would be no assurance that, made up of such material, its very consistency might not cause more harm than good.

But there is another side to this question. For a long time there has been a feeling, more especially at the west, that any legislation, which in any manner favored patentees or owners of patents, was legislation in the interest of monopolies. People still submit to monopolies created under our tariff laws, for the benefit of the rich manufacturer, but the so-called monopoly created by the patent laws primarily for the benefit of the poor inventor, they abhor.

This is a matter which should be given more earnest consideration. The difference between a patent and a monopoly is vast, and it should be explained on all occasions in unambiguous language. The one is based upon the moral right which every man has to his own creations; the other is a wrong, and based upon the most selfish theory of Government. Congress has said to the people, "If you will invent something new and useful which will benefit mankind, there will be given you the exclusive right to produce your new thing for a limited number of years." Under this offer came the production of the telegraph, by which man was benefitted for all time beyond calculation, and the inventor for a limited time received a comparatively meagre compensation. Whatever may have been the cost of the telegraph apparatus to the consumer during the existence of the Morse patent, since its expiration the cost has been nominal, compared with the amount of money telegraphy has saved.

Since that time there have been many telegraph companies in existence. Suppose Congress should pass a law next year prohibiting everybody from establishing telegraph lines in competition with the Western Union, giving to the Western Union Telegraph Company the exclusive right to set up telegraph poles, and build and operate telegraph lines all through the country at its own prices, and making it a punishable offense if any one infringed upon this right. This would be a monopoly. There could be no justice in depriving the country of what advantages it might derive in the future from an honest and active competition in telegraphy, by the use of things which people have long had the right to use in the desired manner, and have used for many years, and men would be justified in adopting any measure to prevent the success, and bring about the overthrow of such a scheme.

A patent is not a monopoly, but a property bought with a price, viz: the disclosure to the public of something new and useful. In return for this disclosure, there is given to the inventor the right to make such profit on his invention as he can for a term of seventeen years, after which time the public has the right to avail himself of the patentee's knowledge, and of the demand for the article, which in the meantime the patentee has created, and enter into such competition as may seem best. When the invention has shown itself to be of great value to the public, as in the case with the telephone for instance, or the driven well, numberless infringers have appeared, who are as much worthy of punishment as any other class of law breakers. Yet because of the very fact that they are helping to fill a popular demand for an article at a lower price than that which the consumer can otherwise get it, they contrive to so influence public opinion, as to get the sympathy of the people at large, who do not look at the moral question involved in the withholding from the inventor of the profits to which he is entitled, but only realize what their pocketbooks tell them.

This is really the class which the patentees have to fear. The people who compose it, believe in getting all they can for their money, and in giving the eighth commandment a narrow and strict construction unless they can benefit by a broad and comprehensive one. They have been brought up to believe they must not steal a sewing machine, but they see a vast difference between that and building a sewing machine, which embodies the vital principle of the one they wish to steal.

This is the class which, when the question comes up of establishing a new court with five judges receiving salaries aggregating $40,000 a year in order that inventors may be the better protected, will pooh-pooh at the whole thing and instruct their congressmen to deprive the patent law of what ever life there is in it. It is decidedly best that the attention of such men should not be called to the system, especially now that bottom patent of the so-called telephone monopoly has been sustained by the Supreme Court. Unless we are very careful, these men will assert themselves to the serious embarassment of all the manufacturers in the country.

Under this state of facts, is it not better for those of us who are interested in patents, both as investments and as properties which we are called upon to create and protect to keep very quiet and let well enough alone? The thorough and complete application of the civil service law to the patent office, will do as much if not more good than the creation of a Court of Appeals. Let us become thorough believers in Civil Service Reform and see that it is applied rigidly in all the branches of government and to all classes of employés and so benefit ourselves and others as well. When this has been done and the patent office is filled with a body of men and women, well qualified and interested in their work; by a more careful promulgation of the theories of the patent law and by expositions of the benefits of the patent system to the country, we may be able to create public opinion in favor of the system, or at least remove the prejudice against it, and when this is done we may safely take the next step and ask for money and more stringent measures for the protection of the class of property upon which all our manufactures without exception are are based directly or indirectly.

George O. G. Coale.

Boston, Mass., May 1, 1888.

... An order was passed for the committee on lamps, of Boston, to investigate and report as to whether the city is obtaining the full candle light power called for by contract or otherwise, from the companies furnishing electric lights to the city. Here's an opportunity for the man with an eye that can tell a 1,200 candle-power lamp from a 2,000 candle-power.

An Associated Press Report as a Pointer for the Boys.

Not long ago, General Manager Phillips, of the United Press, summoned several of his outside managers to New York for a Sunday conference, and he delivered to them a lecture as to the proper way in which to prepare news for the wires. He was especially caustic in his remarks as to how fires are generally reported, says the New York *Journalist*. Mr. Robert W. Martin, who has charge of the foreign service of The United Press, was not invited to be present at the conference, but he heard of it and in order to show that he was in sympathy with the movement, he has since submitted his views on the subject of fire reports in the appended despatch:

VALLEY STREAM, L. I., March 20.—A disastrous fire broke out at half-past seven o'clock this morning, in the two-story dwelling of our respected townsman James Peterson, upon which, it may be mentioned, that public spirited citizens recently expended $65 in repairs, painting, etc., devastating the entire block. Edward Allen who was passing at the time, on his way to work on the new town pump, gallantly rushed to the Baptist church, two miles away, and gave the alarm by ringing the new bell, which the congregation only a few weeks ago purchased with the proceeds of their enjoyable and highly successful fair.

Upon being assured that the clanging of the metal-throated summoners of Christians to worship was an appeal to our ever-ready fire department to battle with the devouring element, the members of the Deluge Engine Company No. 1, with all possible speed, and from every direction, repaired to their new engine house on High street, and seizing the drag-rope of their oft-tried and never-found-wanting apparatus, which only last week was beautifully painted and decorated by our worthy fellow-townsman, Peter Smith, the noble fellows dashed with reckless bravery toward the red tongue of flame which illumined the sky.

With generous disregard of the fact that the bright red wheels and azure-hued body of their splendid engine were being bereft of their lustre by the inconsiderate mud, the heroic firemen plunged madly on, and ultimately reached the scene of the conflagration. There a never-to-be-forgotten spectacle met their eyes. Angry forks of flame shot forth from the devoted building, while dark clouds of smoke rolled sullenly heavenward. The hardy fire-laddies lost no time in getting to work, but the fact that the engine was discovered to be hopelessly out of order, together with the circumstance that the hose was found to be bursted in many places, and the unfortunate failure of the firemen to find a drop of water within a mile of the fire, undoubtedly caused great inconvenience and possibly militated somewhat against their saving the building, which, together with the contents, and all its occupants, was entirely consumed. This result, however, is due in a very great degree to the fact that the house was almost entirely burned before the firemen arrived on the ground, and in no wise reflects upon their efficiency.

The only one of the Peterson family who escaped alive was James Peterson, senior. An overruling Providence, which miraculously supervenes to avert calamity to weak humanity, led Mr. Peterson to engage in a game of chance at Coon Dam last night, thus removing him from danger. He was met on the road three miles from his late home as he was returning with his winnings at cards ($4.60) and gallantly rescued by the firemen.

Too much praise cannot be bestowed upon the members of Deluge No. 1 for having prevented the flames from spreading to adjoining buildings, though in thus averting a possible holocaust they were perhaps assisted to a slight extent by the fact that the nearest house to the fire was three-quarters of a mile away.

Mr. Peterson's loss is $138.60, partly covered by insurance and his winnings at Coon Dam.

Telegraphic Signals.

There is nothing that gladdens the eyes of the telegraph editor quite so much as the magical "30." The compositor at the case likes to see it, too, for he knows it is the end of telegraph copy for the night. The telegraph operator has a fancy for "30" also, as, indeed, has every one who has anything to do with a telegraph or a newspaper office. This "30" means literally "the end," and is the signal that the telegraph report is complete for the night, but just why it should be so, or how this came about, no one can probably tell with any accuracy, but it is a part of a code of signals adopted by telegraph operators long ago. They hit upon it at random, doubtless, and it serves its purpose satisfactorily. By the same token, the figure "1" is used as the signal, "Wait a minute;" "2," and sometimes "12," means "Answer how you understand me;" "3," and sometimes "13," means "I understand;" "18" means "trouble;" "25" is "busy on another wire." These are the signals most commonly used by operators engaged on ordinary business or dispatches intended for the newspapers, but signals and ciphers are used in a thousand occupations. The train dispatcher has his code, and the signals therein save him a world of work and pounding of the key. For instance, "7" may mean "train orders," and "9" be the signal used by the president of the road. When "9" flashes along everything on the wire gets out of the way, just as everything is side tracked when the president's car comes whizzing down the rails. It can be readily understood how these signals save time and labor, on the principle that stenography is better adapted to the condensation of phrases and sentences than longhand; in a single figure a world of meaning can be expressed, but to the overworked telegraph editor, who has been slaving all night with his head close to a gas lamp, and whose brain is buzzing and sizzing, the signal "30" is the sweetest and the dearest of them all.

Sending a Dog by Telegraph.

While depot agent and telegraph operator in a small town in Western Texas, many amusing incidents and conversations took place, which under other than the circumstances surrounding me, says a correspondent, would have been enjoyable, but harrassed by the many, and often foolish, questions that were put to me, they proved a fruitful source of annoyance. The most ludicrous that I think of at present was occasioned by an old gentleman wanting to send a dog by telegraph.

He came in hurriedly, and after gazing at a large clock—that was placed where all entering the depot could see it—for some minutes, he asked:

"What time is it?"

"Half after eleven. Can't you see the clock?"

"Yes. Is it right?"

"Yes."

"Is it railroad time?"

"Yes."

"Would I have time to telegraph a dog to Squire Johnson at Madison afore twelve?"

"Telegraph a dog?"

"Yes, send a dog to Squire Johnson by telegraph."

"Can't send him; most too bulky a dispatch."

"A what?"

"I say we don't send dogs by telegraph."

"Yes, I guess you do, Squire——"

"Say, old man, you are out of your head."

"Guess you are mistaken, young man. Squire Johnson——"

"Who the d—l is Squire Johnson?"

"He's one of the cleverest chaps you ever seed, young man. He lives down at Madison, and when he was up not long 'go he bought a greyhound from me, an' I was to take it down to-day by twelve or telegraph him. I couldn't leave the old lady—you know she's down with the rheumatism—so I thought I would come down and telegraph him."

"Oh, yes, I understand you now; you want to telegraph the Squire that you can't bring the dog?"

"No, I want to telegraph the dog to the Squire."

"Didn't I tell you that I couldn't telegraph a dog?"

"Yes, but the Squire——"

"The Squire be blasted—and you too."

"Young man, don't you think you would have time to get him down there by twelve, I'm needin' the money for the dog powerful bad, an' the Squire——"

"Say, old man, wish you would get through with the Squire and stop your racket. I've got other business to attend to."

"Well, when do you think you can send the dog down to the Squire—— ?"

"You send the dog—Squire and all go to the d—l."

"Seems like you ought to know, young man, bein' as it's your business, but the Squire's mighty peart, an' he said to telegraph him."

The Bell Telephone Company Wins a Case.

A despatch from Harrisburg, Penn., May 1, says: Judge Simonton to-day filed an opinion in the case of the State against the American Bell Telephone Company to recover a tax on capital stock. The State contended that the Massachusetts company is liable to be taxed upon the part of its capital stock represented by the number of telephones in this State as compared with the whole number in the United States. The court, however, holds that the leasing by it of telephones to be used by Pennsylvania corporations in Pennsylvania under the letters patent granted by the United States does not bring the Massachusetts company within the jurisdiction of the State of Pennsylvania.

Telephone Work in Buffalo.

The overhead wires are in process of burial at Buffalo. Vice-President E. J. Hall of the Bell Telephone Company was seen by a reporter with a view to find out why the wires remain overhead so long after the time specified for their removal. He said: "We have all the men at work that can be employed to advantage, connecting the cables and adjusting the work at the office end. We are pushing it as fast as we know how, but it is a kind of work that only a limited number can be employed at. The five experts engaged have connected the cables as far as Goodell on Washington, and as far as Tupper on Pearl."

Dr. Taylor, the assistant superintendent, said: "We expect to have the whole work completed and the underground wires in working order by next fall. There are two and a half miles of conduit laid, and about ten miles of cable. During the present year this will be just doubled. We have 1,000 miles of wire practically ready for connection, but it will take three or four weeks to connect the wires already underground; I don't mean to say that in that time they will be in working shape, but they will be in a fair way. What has delayed us has been the difficulty of getting manufacturers to come to time with the necessary apparatus. The switch-board costing $15,000 is considerable of a hitch, but we can't afford to make any mistakes about it. The burial will take place first of all on the main lines on Washington, Main and Pearl streets, thence gradually. We are as desirous as anybody to lose no time in the matter, and none has been lost so far as we are concerned."

A Telephone War in Montreal.

There are merry times ahead in telephone circles in Montreal, says a correspondent, and either a big game of bluff or some heavy litigation is on the tapis. The Bell Telephone Company, weary of waiting for the permission of the Corporation to erect their poles on St. James, Notre Dame, Beaver Hall, Dorchester and Sherbrooke streets informed the City Surveyor that they would commence work immediately, and as a matter of fact are already laying down the poles upon some of the streets in question. The company, it appears, has up till now, in deference to public opinion, refrained from utilizing these main thoroughfares, and were desirous of laying the wires underground by means of subways. Now that the rival company has come to the fore they are taking advantage of the privileges they claim are granted in their charter of erecting poles in the above mentioned streets. It is rumored some startling developments are in store should the matter end in litigation.

A writ of mandamus was applied for to restrain the city from allowing the Federal Telephone Company to erect their poles in the streets, which they were granted leave to do at a recent meeting of the Council. The petition alleges that a resolution was passed to this effect, based in a report of the Road Committee. Before this report was adopted a new Council was elected. This proceeding, it is alleged, is illegal and the resolution should be declared null and void. Ald. Grenier, it is further stated, voted for the resolution, and as he is the vice-president of the company, and a large stockholder, his vote should be set aside.

The assistant City Attorney declared that the report of the Road Committee had been legally considered and adopted by the Council. The point raised in the petition for a mandamus had already been decided and declared perfectly legal.

Telephonic News

*** Mr. W. D. Sargent returned from Florida last week, in much improved health.

*** Messrs. Holmes, Booth & Haydens have just issued and interesting and attractive wire list.

*** Mr. Harry Hall, formerly of the Western Electric Co., has accepted a position with the enterprising firm of Hazazer & Stanley, of 34 Frankfort street, this city.

*** Mr. T. B. Doolittle, of the American Bell Telephone Company, has transferred his affections to the State of Pennsylvania, and Harrisburg in particular.

*** Telephone poles are being distributed from Moose river to Boonville, and as soon as the snow is off the ground they will be set, and the wire run through the woods to Old Forge. The telephone will be supplied with long distance transmitters, and will prove a great convenience.

*** A slate for telephone desks has been patented by Mr. Emil T. Mueller, of La Crosse, Wis. It consists of a sheet of suitable material covered with a slate composition, and having retaining clips adapted to clamp the edges of a desk, and hooks to hold a slate or lead pencil, to be constructed of various sizes to fit different desks, for conveniently recording messages.

*** A telephone transmitter by Mr. John M. Graham, of Pittsburgh, Pa., says *Scientific American*, consists of two pairs of contact springs arranged to press opposite ends of electrodes carried by springs bearing on the diaphragm, one contact spring of each pair being connected with one terminal of the induction coil, the electrodes operated by the diaphragm being connected with the terminals of the local battery, whereby the current in the local circuit is reversed during each vibration of the diaphragm.

*** The question of right of way for underground telephone wires in the streets of Berlin has been debated between the Town Council and the postal authorities for some considerable time, the latter claiming the right to lay cables through any thoroughfare, and the former refusing it. The matter has at last been settled, and, under the new agreement, the Post Office will be able to put as many wires underground as they think fit. This will greatly relieve the overhead system, says *Industries*, which had already threatened to become unmanageable, on account of the multiplication of circuits. The total number of telephone subscribers in Berlin is now about 10,000, and the tendency is still to increase.

*** One has to go to other cities in order to thoroughly appreciate the revolution brought about by the use of the telephone, says the N. Y. *Sun*. In small cities like Cleveland, Detroit and Rochester, all the well-to-do people have telephones in their dwellings, and the useful instruments are made to serve instead of letters, visits, and the employment of messengers. The ladies use them quite as much in the routine of household life as our down-town men do in business. After breakfast in the morning, a provincial lady who has a telephone is apt to closet herself with it for a half an hour or more, during which time she finds out what the grocer has that is good to offer, sends her orders, connects with the butcher, and tells him what she wants; rings up her dressmaker and has a delightful chat over trimmings and flounces, and then calls upon one after another in her circle of lady friends, and gossips with each and all precisely as she would if she were making a social round in her carriage later in the day. The average New Yorker has scarcely any conception of the usefulness of a telephone as it is employed in other cities.

Lima, Ohio, is to have an electric road. The Silvey Electric Works is building the motor.

In Monteagle, Tenn., an electric light plant is to be erected at the Monteagle Hotel, and machinery is being purchased.

Mr. A. L. Bogart, of Union Square, New York, is doing a rushing business with his improved automatic electric gas burners.

The electric storage street car experiment in Baltimore has been pronounced a success, and the new motor, say the Baltimore papers, has come to stay.

Says London *Electrical Review*: "A friend has suggested that one of the rules of the Society of Telegraph Engineers and Electricians, which we published in our last issue, must have been sent from the Emerald Isle: 'When conductors are carried in very inflammable structures, precautions should be taken to isolate them therefrom.'"

Electricity is the motive power for several establishments in Oakland, Cal. It runs a coffee-mill for the New York Tea Company, moves a score of sewing-machines for M. J. Keller, manufacturer; rotates an ice-cream freezer for O. C. Coiner, wiggles a sausage machine for Fred. Becker, and is to give power to the presses in the *Evening Tribune* building.

This week the Ft. Wayne Jenney Electric Light Company are sending out six 800 light dynamos of the Slattery alternating system—a splendid week's work. Two of these go to New Orleans, one to Utica, N.Y., two to Chicago, and one to the local lighting station at Ft. Wayne, Ind. Next week, four 800 lighters are to be sent East. The plants of this system that the company has put in, we are informed, are all doing splendidly, not a single hitch up to the present time.

The trial trip on the new electric road at Ansonia, Conn., is said to have been very satisfactory and successful. The road was commenced May 2d, 1887, and has cost, including the electric plant, $75,000. The road bed is firm and is in good condition. During the trial not over one-third of the power that can be generated was used. No attempt at speed was made, although on the avenue a speed of 12 miles per hour was reached. The entire length of the road is three and three-quarter miles. It is not yet decided when regular trips will be made, but not for several days yet or until the cars and motors get limbered up. The equipment of the road consists of three motor passenger cars, one large freight motor and half a dozen freight cars, besides one ordinary passenger car to which horses can be attached. Although it was a free ride there were three fares placed in the box, the two first being by M. J. Flaherty of the *Sentinel* and the *American* representative. Thus opened the first electrical railroad in Connecticut.

Concerning Electric Tram Cars.—The Société l'Electrique have entered a protest against M. Michelet's report attributing the deficit on last year's working to the electric traction. They say that if there is a loss, it is due to the bad management of the tramway company, which wasted a large amount of money on the charging station in the Rue Juste-Lips. In addition, the expense of working a station intended for at least forty cars has been debited to two cars only. They consequently consider that the report does not give a fair idea of the real cost of electric traction, which is as cheap as horse traction. In order to prove this the Société l'Electrique are willing to contract for electric traction, and if the tramway company refuse the offer, their conduct could only be explained on the score of prejudice on their part against electricity in any shape or form.

The Battle of the Electric Giants.

Transformers or accumulators, that is the question; and whether it is better in all respects to use the one or the other has not yet been decided. The siege of Troy was a lengthy combat—filled with some stirring episodes; but there sword and spear formed the conquering weapons, and the deeds of the heroes have been sung to every successive generation. The contest between transformers and accumulators is of another kind. The arena may witness a victory as far-reaching as that of the Greeks over the Trojans, and of greater benefit to the world at large; but there will be no Homer to sing pæans to the victors. The struggle is not likely to be over for years, nor can the ever-increasing skirmishes of the present have much effect upon the ultimate result. Pocket-pistols and huge and massive manuscripts may turn the scale of debate in the theatre of the Institution, but the real decisive blow will come from a future giant—the Giant Experience.

The transformer troops, under the able leadership of Mr. Kapp, entered recently into the war, with banners flying and trumpets sounding, to encounter a steady and determined resistance all along the line, and it can hardly be said that ground was gained on either side. The defenders, however, of that attack have taken courage because of the unsatisfactory result of this preliminary skirmish, and, under the ægis of Mr. Crompton, have charged with might and main. Writing early, yet after the reveille has sounded and the troops have armed for the battle, but before the actual meeting of the contending parties, we cannot detail the result of the struggle, though it is almost certain we shall not be far from the mark if we venture to foretell that it will leave the contending parties pretty much as they were. The experience that has as yet been gained, either from the use of transformers or from that of accumulators, is far from being able to lead to a decisive opinion. The staunchest supporter of transformers almost always adds a saving clause to his argument in, "If accumulators can be obtained which may be depended upon for economy and lasting properties, then they will provide a better means of distribution than by transformers," but he adds in an aside: whatever may be said to the contrary, "such accumulators are not in existence yet." The supporter of the accumulator agrees with his opponent *sotto voce*, yet aloud disputes that his apparatus is imperfect. No one has yet formulated his requirements for a perfect accumulator, nor are we going to venture where the giants fear to tread. When one or the other of the leaders will define what is wanted or what can be given, as clearly as we can define what the industry would like to obtain in incandescent lamps—for example, thus: "A lamp with three watts per candle to give twenty candles for a thousand hours, without blackening to the extent of losing one per cent. of the light, and costing eighteenpence"—then we can say how far the perfect accumulator will permit them to do what is required in central station lighting.

We Englishmen are apt to magnify the meaning of our words. A river here would be a brook, if not a ditch without a distinctive name, in America. Anything above a couple of score of lights is a central station here. It makes us feel large and think much of ourselves to be able to talk about so many central stations; but, after all, when we really come to look into the matter, what does it amount to? The Grosvenor Gallery installation may be approaching its 20,000 lamps, and that is the only one at present worthy of the name "central station" in the whole country. The experience of the Grosvenor Gallery has been wholly in the direction of transformers, and if we may credit unsolicited, and, so far as we can judge, unbiased testimony, the result is not quite perfection. The experience at Kensington Court is not sufficiently large, nor is the experience at Vienna sufficiently lengthy, to warrant a decisive conclusion from the results obtained. There is a tale about a man whose mule was little restive under chastisement, and indolent without. A castigation was necessary, and a stick was pulled from the adjacent hedge. It broke at the first stroke; another, stouter, greener, and tougher, was obtained, and for thirteen consecutive whacks appeared uninjured, yet on the fourteenth it also broke to pieces, and the mule was still indolent. Æsop always wrote a moral to his fables for fear the Greeks should not see it; and, following so admirable an example, we say accumulators may look well

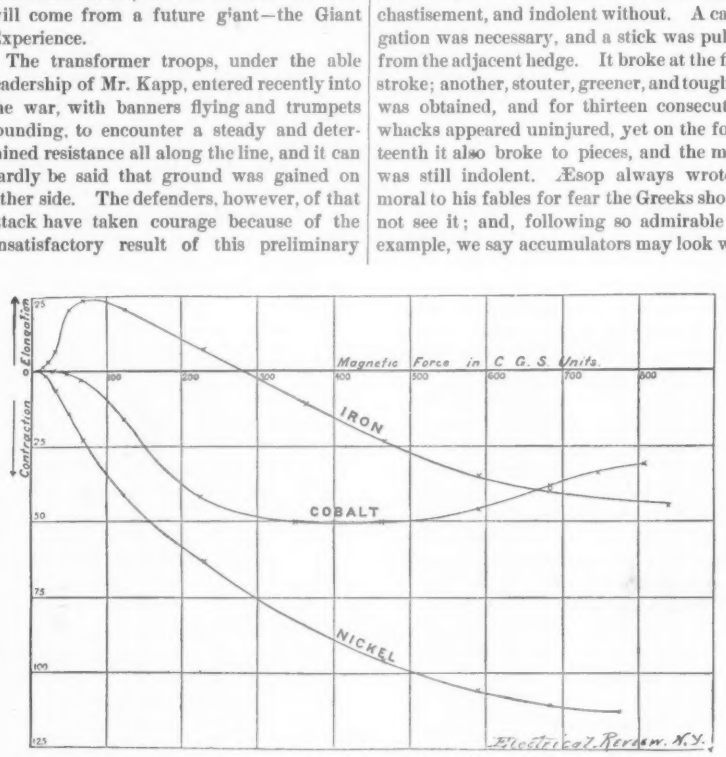


Diagram Showing Elongation and Contraction of Metals in Metallic Fields. (See Page. 2.)

for one or two months or years, but may go to pieces the third month or year. Has experience shown that you may rely upon a depreciation of 10 per cent. being within the mark? What is the depreciation to be allowed that will give satisfaction all around?

If we have said too much about accumulators, and too little about transformers, as it is necessary to bestow an equal share of favors, attention may be directed once more to the great and almost constant loss that arises from working machinery far below its normal output. This result must, we fear, happen when transformers are used. A house wired for fifty or a hundred lamps will, as a rule, not turn on more than a fifth of the number, yet its transformer must be designed to supply current to the maximum number. What about efficiency under these circumstances? Extended experience alone will give us the facts and figures required, while the facts derived from a limited experience may become of the nature of fictions under the clearer light of time. In the workshop and the laboratory, our tests are made under the most favorable conditions, and of course efficiencies are satisfactory. The present transformer and the present accumulator are progressive steps in the evolution of the electric lighting industry, and will play their part just as the Alliance machine played its part, and will give place to something more perfect and more efficient. Still, what we have will enable us to do what could not be so satisfactorily done three years ago; and taking into consideration the circumstances of each special case, the engineer will determine which is the better for that particular installation—transformer or accumulator. This discussion is one that more particularly interests the industry, and not the public. We know that an installation can be carried out with either; and the public will not be deterred from purchasing because one firm advocates transformers and another accumulators, any more than they are deterred from purchasing steam engines because one maker advocates stationary and another semi-portable engines. Nor has efficiency much to do with the public, when all the contention is about .001 or .002 per cent. of the original energy when normal conditions operate. Go on, then, thrashing out these points of detail, tabulating experience, fighting for opinions as held now, but leave a loophole for change due to the further experience that is to come.—*London Electrical Engineer.*

Personal.

W. A. Kreidler, editor of the *Western Electrician*, Chicago, has been a New York visitor for several days past.

Mr. Geo. Washington Adams, of Boston, was a New York visitor and general observer of things electrical the first of the week.

Mr. F. E. Pettingell, of Boston, representing the new and active young company of F. E. Pettingell & Co., was a New York visitor the first of the week.

Mr. Frank Harrington was a New York visitor this week. He reports the business of the Western Electric Company in the matter of multiple switchboards and magneto bells as very active.

R. F. Ross, manager of *Modern Light and Heat*, came over to attend the meeting of the Executive Committee of the National Electric Light Association, at the Electric Club, last week.

President S. A. Duncan, of the National Electric Light Association, was a visitor at the Electrical Review office, last week. He came over from Pittsburgh to attend the meeting of the Executive Committee of his Association.

Mr. W. J. Armstrong has accepted a responsible position with the Bishop Gutta Percha Works, New York. Mr. Armstrong is a thoroughly capable accountant and a gentleman of reliability, and will be a valuable assistant in the growing business of this company.

Mr. Eugene T. Lynch, Jr., has resigned as general manager of the United States Illuminating Company, and as soon as he can satisfactorily arrange several electrical matters in which he is interested, contemplates a trip abroad to investigate the underground and other electrical questions in foreign countries. President Lynch will, to a large extent, assume the duties of the position made vacant by his son's resignation.

The Ft. Wayne Jenney M'f'g Co. has put in a great deal of new machinery recently, and is running till 11 and 12 o'clock at night.

The Western Union is putting in a number of new telegraph offices in the South. Arrangements are being made to open offices at Ensley City, Boyle's Gap and Thomas Furnaces, Alabama. The connecting lines are all up and the instruments have arrived. The company expects to have the offices open within less than ten days. Telegraph offices have been greatly needed at the above named places, and will prove a great convenience to the public. The company contemplates opening several other offices in the county before summer, but as yet no definite arrangements have been made for opening any but the three named above.

The Western Union Telegraph Company has filed a libel for $60,789 in the United States District Court against the Inman Line steamship City of Richmond. The action is brought to recover damages sustained by the telegraph company by reason of the steamship's wheel churning twelve cables extending from Cortlandt street to Jersey city on the river bed. The accident occurred on August 19, 1887, while the City of Richmond was landing at the Inman wharf. The cables were all broken, and remained inoperative for sixteen days. The Western Union asks for $10,789 for repairing its wires, and $50,000 for loss sustained by reason of its inability to transmit messages. Some time ago the Inman Company brought an action for $2,000 against the Western Union for replacing the City of Richmond's screw, which was broken by contact with the cables.

The Recent Electrical Work of W. S. Hill.

Mr. W. S. Hill, 133 Oliver street, Boston, Mass., has for nearly ten years been engaged in the manufacture of arc lamps, fixtures, and small work pertaining to both arc and incandescent lighting. In his long experience he has made many valuable inventions and improvements. We herewith illustrate a few of his most recent inventions.

An arc lamp is shown that is of simple construction, having all the desirable features of the most modern usage, yet free from small or delicate mechanism. They are made to take currents varying from four to ten amperes.

A new cut-out switch for arc or series circuits is shown in Fig. 2. The contact terminals are mounted at either end of a base board, between which is placed a stand carrying two spring levers, with insulated connectors of thin sheet copper. A cam lever operates to depress and close either circuit before the other can be broken; thus, if a loop or circuit of lamps in a building is to be cut into a main circuit, as the cam lever is turned, the copper brush connectors will be pressed down between the inclined surfaces of the double pole terminals of the new circuit before the connection with the main can be broken. A stout spring that surrounds the axis of the spring levers is arranged to raise and open the circuit of both sets of connectors in common, as the handle is turned in either direction. The switch is covered with a neat box with a glass cover, through which the words "ON" and "OFF" can be seen on the handle of the cam lever.

Fig. 3 shows a double pole switch in which the same plan of contact connectors are used as in the cut-out switch. Two pairs of contact terminals are placed in line on the base board as shown; the inner side of which is beveled, so that when the wedge shaped contact brushes are pressed down between them, the most perfect electrical connection is obtained.

The connecting brushes are secured to and insulated from the pivoted lever, and as the handle is pressed down a projecting arm bears upon a cam surface on the lever, and the connecting brushes are pressed between the inclined sides of the terminals, closing the circuit; when the handle is raised bringing the projecting arm off the cam surface, a spring pressure raises the lever and makes a quick break at both poles simultaneously.

It is a solid and durable instrument, with large contact surfaces, and is well calculated to deal with large currents.

Fig. 4 shows a dynamo of a new pattern recently designed by Mr. Hill, which has some good features. The frame is made of cast iron, but the magnet cores and pole pieces are of soft wrought iron, the effect of which is to give nearly or quite as good results as if the whole frame was made of wrought iron, with a very considerable saving of cost.

The armature is of peculiar construction, recently patented by Mr. Hill, and is claimed to develop no heat in the iron, the machine being guaranteed to run cool, unless greatly overloaded so as to cause heating of the wires from excess of current.

The field magnets are shunt wound for incandescent lighting and give very perfect regulation. It has as yet been made only in small sizes of ten to 100 lights; a machine weighing 280 lbs. gives 50-70 volts, 16 candle power lamps, at 2,000 revolutions; a 10 light machine weighs 125 lbs.

A large machine for arc lighting is in process of construction and will be fitted with a new automatic current regulator, recently patented by Mr. Hill.

Fig. 5 shows a key socket and lamp, the new feature of which is the manner of attaching the lamp to the socket. The lamp terminals are of stout wire, and are bent at right angles to form arms as shown in fig. 6; as the lamp is inserted into the socket and turned partially around, these arms pass under wire springs that hold the lamp securely in place and also put it in electrical connection with the circuit.

A pin in the brass cap of the lamp, and a groove in the socket ensures the lamp entering in the right place and limits the turning motion so no injury can come to the arms or springs.

The Electric Light Nearest the North Pole.

American enterprise is felt at Hernosand, Sweden, which has just been provided with the most northern electric light station in the world. The lamps there are lighted at 2.30 o'clock in the afternoon, and put out at 12.15 o'clock at night.

—— The Waterhouse Electric and Manufacturing Company has its San Francisco office at 406 Market street. Mr. W. C. Clark is the company's agent in that city.

—— The Boston *Journal* says representatives of the Thomson-Houston Company are to inspect the Boston West End Railway line to Harvard square, with a view to operating it by electric cars on the Van Depoele system. The power station will be in the vicinity of Harvard square.

—— The Rhode Island Electric Light Company, of Providence, is now running about 800 16-candle power incandescent lights, 230 2,000-c. p. arc lights and 160 Mogul lights. The re-building of the Westminster street main line, says the *Journal*, is a very extensive undertaking and one which cannot fail to be appreciated when it is completed and the present low poles are out of the way. The posts are of hard pine 10 by 10 inches and are 31 feet high above ground. The cross arms are to be of the best hard pine 3 by 4 inches and 6 feet long, and will average four arms to a pole. The two top arms are to be used by the Narragansett Company's lines and the two lower ones by the Rhode Island Company. There are fourteen lamps to be suspended by the Russell Manufacturing Company's mast arm in the centre of the street. This mast arm is composed of 2½ inch gas or steam pipe, having a slot cut in the under side from end to end ¼ inch in width, through which extends or drops a pendant or flat piece, which is supported on a small carriage having four beveled wheels cut to fit the inside periphery of the pipe. To this protruding piece is fastened the lamp, which is drawn in and out from the pole by means of a cord passing through the pipe and over a pulley placed at the outer end of the pipe by means of rollers placed on the mast in reach of the operator. The main pipe is braced from the sides midway and is fastened to the mast by a flange. By means of the arm a lamp can be placed anywhere from five to thirty feet out from the mast according to the height of the mast.

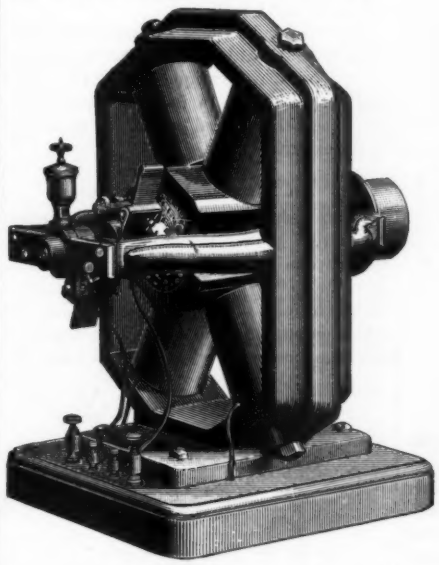


FIG. 4.

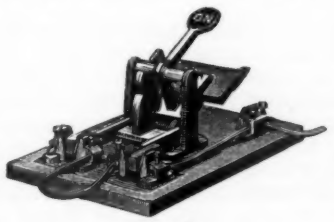


FIG. 2.

FIG. 3.

THE HILL DYNAMO, SWITCHES AND LAMPS.

—— The Greenville, South Carolina, City Council, after a long deliberation, finally decided the much mooted electric light question by voting for the adoption of the system. The city has long been poorly and insufficiently lighted by gas, and the proposition to light the streets by electricity has been actively and thoroughly discussed for several months past, the scheme meeting with the strong endorsement of public sentiment. Council, at its meeting settled the question on the side of progress, and placed Greenville another step forward in the race of pushing, wide-awake, modern towns. The Brush electric light was adopted. The contract will be to furnish the city with a complete plant with a capacity of forty or sixty arc lights, and three hundred and fifty or four hundred incandescent lights, the same to be owned and operated by the city. A committee was appointed to complete the details and to sign a contract, and the Brush Company propose to put in the plant and have it in operation in sixty days. It is expected to be in full blast for the summer gala week, when it is proposed to light the beautiful University hill, the site of the soldiers' encampment, with a number of arc lights.

FIG. 5.

FIG. 6.

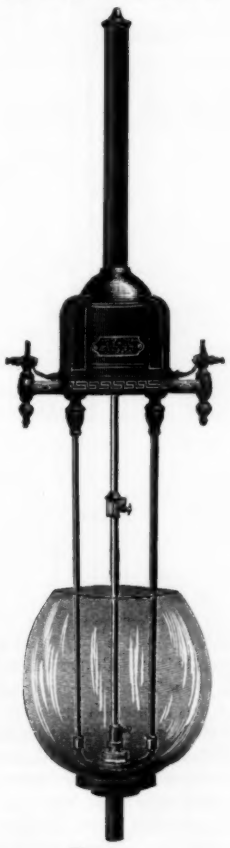


FIG. 1.

ELECTRIC LIGHT NEWS

—— A Waterhouse plant is being put in at Livermore, California.

—— An electric light plant, to cost $10,000, is to be erected at Media, Pa.

—— An electric light plant is under contemplation for University Place, Ga.

—— The new manufactory of the Western Electric Company, in this city, will cost about $250,000.

—— El Paso, Texas, Gas, Coke & Coal Co. are contemplating the addition of an electric light plant.

—— An electric light plant will shortly be in operation at Wanwatosa, Wis., J. O. Meyers having the matter in charge.

—— The Salem (Mass.) Electric Lighting Company has increased the incandescent lights from seventy-five to 125-candle power.

—— The arc light system at the State Lunatic Asylum, Utica, N. Y., was put in operation for the first time last week and gave perfect satisfaction.

—— Spain is the place for electricians just now. The Government has decreed that all the theatres in the kingdom shall adopt the electric light within six months.

—— The electric light committee of Easthampton, Mass., have organized, with Capt. David Hill as chairman, and are receiving applications to furnish the town with lights.

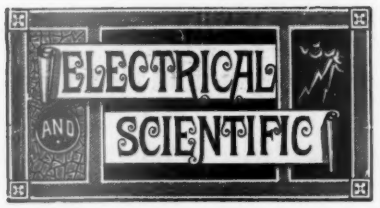
—— The Paris Gas and Electric Light Company at Paris, Tex., intends to add a Westinghouse incandescent plant. It is expected the entire plant will be in running order by August 1 next.

—— The Toledo Electric Co., of Toledo, Ohio, has been reorganized with Mr. N. C. Stevens, late of Quincy, Ill., as manager. The plant will be remodeled and increased. Two 13x12 enginee have been ordered from the Ball Engine Company, of Erie, Penn.

—— The Springfield *Republican* says: With the absorption of the Westfield (Mass.) electric light plant by the gas company, come plans for considerably increasing the capacity to furnish electricity for lighting purposes. The present electrical building on Orange street will be given up, and a brick building, 40x100 feet, will be erected near the gashouse, giving room for dynamos and boilers that will run four times the number of arc and incandescent lamps now in use.

—— The late award of electric lighting for Hagerstown, Md., by the street commissioners to the Schuyler Company has produced some feeling among the other contestants. The representatives of one of the disappointed companies threaten injunction proceedings to restrain the signing of the contract. They claim they expended over fifteen hundred dollars in exhibiting this light, with the understanding that the contract was to be given to them. The commissioners, however, deny this statement, and say that the successful company received the contract because its bid was the lowest.

—— In the removal of tumors and other foreign growths, the profession turns to the battery. The tumor is often softened and removed by electrolysis and again by electrical cauterization, by means of needles penetrating the part. Many of the fair sex are familiar with the power of electricity to remove offending hairs from the face. The piercing of the bulb with a needle charged with electricity destroys its vitality for all time. Wire heated white-hot by electricity will accomplish the same purpose. These wires have been made use of by physicians to a wonderful purpose. Their light has laid the hidden recesses of the body open to view, and intricate diseases of the stomach and abdominal cavity have been cured through their agency.



* * The stockholders of the Henderson Steel Company, at Birmingham, Ala., have decided to increase the capital stock to $1,000,000 and at once erect a large plant.

* * Inventors disposing of continental patent rights may now ask for a few thousands extra on account of Switzerland, for the national council of that country has at length passed a bill providing for patents for inventions. Most of our readers will remember that there have hitherto been no patent laws in Switzerland.

* * A wire rope half a mile long, six and one-fourth inches in circumference, and weighing seven and one-half tons, has been manufactured at Gateshead, England. There are six strands of nineteen wires each in it, the breaking strain of the whole being one hundred and seventy-five tons, and that of each wire in the rope, one hundred and twenty tons to the square inch. This immense rope is to be used in a colliery in North Wales.

* * We have sixty divisions on the dials of our clocks and watches, because the old Greek astronomer, Hipparchus, who lived in the second century before Christ, accented the Babylonian system of reckoning time, that system being sexagesimal. The Babylonians were acquainted with the decimal system, but for common or practical purposes they counted by "sossi" and "sari," the "sossos" representing sixty, and the "saros" sixty times sixty—360. From Hipparchus that mode of reckoning found its way into the works of Ptolemy, about 150 A. D., and thence was carried down the stream of science and civilization, and found its way to the dial plates of our clocks and watches.

* * Electricity gives us the brightest light, the highest temperature, the swiftest messenger, and the most potent chemical agent that we possess. It is used for curing the sick, it has been proposed as a substitute for the "cat," or even the gallows. By its means the voice can be transmitted to distances infinitely beyond the reach of a speaking tube. It enables us to hear the footsteps of a fly, to detect base metal in a coin, or the presence of a bullet in the body. We can use it to separate the fine metallic particles from a powdered rock, to propel a boat, or drive a car. Energy from a watercourse can be carried to a distant workshop, and there be used to plate a spoon with silver, to copy an engraving, or to extract a metal from its ore. Finally, it has recently been proposed to utilize the same power for the killing of cattle, and for the treatment of sewage.

* * A dispatch from St. Paul, dated May 2, says: "The great tunnel through the Cascade Mountains on the Northern Pacific road will let daylight through the rock some time to-day. The crowds of workmen who have been working from both sides are now within hearing distance. The tunnel, which is 9,900 feet long, is through solid rock nearly all the way. When the final piercing is accomplished, there will be nothing left to do but to lay a track. Trains will be running through it within two weeks. The tunnel was begun early in 1886, and the contract was for about $2,000,000. When the work was begun there were no roads into the mountains, and all the heavy machinery had to be hauled in on wheels and then transferred to runners. In some places the pressure of the mountain is so great that clay is forced up from the bottom, and an inverted arch stone had to be constructed to keep the clay down. The work has been carried on by electric light, power for which is supplied by a small mountain stream which flows down the mountain and falls directly over the mouth of the tunnel."

The Chicago Gas Trust.

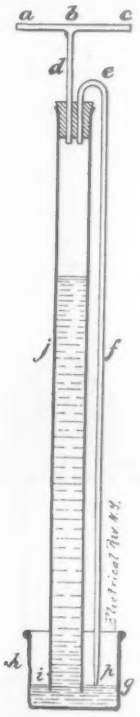
At the annual meeting of the stockholders of the Chicago Gas Trust Company last week the following officers were elected: President, C. N. Fay; first vice-president, E. C. Benedict; second vice-president, W. W. Gibbs; directors, E. C. Benedict, Henry Fitzhugh, William H. Gebhard and Baron E. J. Jerzmanowski, all of New York; W. W. Gibbs and W. L. Elkins, of Philadelphia; C. N. Fay, C. R. Cummings, S. A. Kent, A. A. Carpenter, N. K. Fairbank, W. C. Goudy and Charles Counselman, of Chicago.

A Regulator for Maintaining Constant Exhaustion.

BY S. W. HOLMAN, S. B.

In an investigation on the transpiration of gases through capillary tubes, the following problem presented itself: To maintain a constant partial exhaustion in a closed space of about ten liters capacity, into which a slow, continuous inflow of air or other gas took place; it being also necessary to vary, in separate experiments, the degree of the exhaustion. The apparatus devised to meet these requirements proved satisfactory; and as many occasions arise in physical and chemical work in which this simple device may be of service, the following description is given.

A glass tube, *i j*, about an inch in diameter, stands upright in a mercury trough, *g h*, two or three inches in diameter. Into the



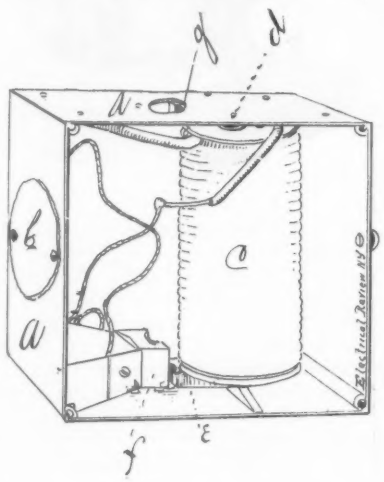
top of *i j* is inserted a rubber stopper with two borings. Through one of these passes one arm of a T joint, *a b c d*, whose other two arms are connected with the aspirator and with the vessel to be exhausted. The latter, if great steadiness is desired, should be several liters in capacity, or be connected with a closed space of at least that volume. Through the other boring passes a tube, *e f p*, of one or two millimeters internal diameter, bent twice at right angles, and dipping into the mercury in *h g*. Suppose that the vessel to be exhausted is closed—the apparatus is available for cases ranging from this condition to a leakage at about half the rate of exhaustion, which can be had through *a*—and that the exhaustion is begun. As it proceeds, the mercury rises eqally in both *j* and *f*, until the mercury surface at *h g* becomes somewhat lower than the point *p*. Then the excess of the external atmospheric pressure becomes sufficient to overcome the resistance of the mercury column in *f*; this rises and flows over into the upper part of *j*, falling upon the mercury surface at *j*. This overflow is, of course, followed by an inrush of air through the open point, *p*, and a consequent sudden lowering of the mercury in *i j*, and rise in *g f*, thus closing *p*. This first sudden action is followed by others of lessening violence, and a steady condition is soon reached, in which there is a continuous inflow of air and small globules of mercury at *p*, the proportion between the two depending on the relation between the size of the tubes, the capacity of the aspirator, and the supply of gas from the vessel to be exhausted. If a fluctuation occurs in either the rate of aspiration or the supply of gas to be removed, a greater or less proportion of air will be taken in with a corresponding but very small change of pressure within the apparatus. For successful working, a proper adjustment of sizes of parts to the work to be done is of course essential, and the final adjustment is made by varying the size of the point, *p*, to which the tube, *p f*, is drawn out. A constriction at some point of *i j* serves to check the violence of the initial fluctuations; and a piece of fine tubing at *e* prevents the too rapid transference of slight fluctuations of the pressure in the top of *j d* to the exhausted vessel. For producing the exhaustion, I made use of the water-jet aspirator devised by Prof. R. H. Richards, of the Institute.

Tubes *j j*, of various lengths, and with the portion at *e* so long that *p* may be considerably raised or lowered by sliding *e* through the stopper at the top of *i j*, render it easy to adjust the regulator to any desired pressure; but where greater range than six inches is desired, it is better to have several tubes *j f*. I have found it possible to maintain constant, within one millimeter, an exhaustion of any amount up to the full action of which the aspirator was capable, although the water pressure ranged from fifteen to thirty-five pounds per square inch by sudden and irregular jumps. With a water pressure ranging within the limits of a few pounds, and with an apparatus arranged as described in the paper referred to, I have found it "feasible to keep the pressure constant within a millimeter throughout a whole day's experimenting. The exhaustion during a series of experiments occupying more than half an hour, frequently remained constant within 0.2 or 0.3 mm. In a single experiment a change of 0.2 was rare, the average being under 0.1 mm."

Various modifications will readily suggest themselves to persons using the apparatus, by which it may be adapted to special work, and even extended in its application to the case where the internal pressure is in excess of the external.

An Electrical Chestnut.

From a shop scrap heap, and pretty near the bottom at that, the subject of our illustration was recently resurrected, and has been deemed worthy a place in electrical ancient history. *A*, *A*, is a brass frame upon which an insulating plate of leather, *b*, serves to attach binding screws for the terminals.



C is an electro-magnet suspended on a center, *d*, so that the lower end of the core, *e*, was free to approach or recede from the permanent armature, *f*. This armature, as well as the pole-piece, had a curved slot perpendicularly beneath the opening, *g*, in the upper plate of the frame. The reader by this time has probably wakened to the fact that this is part of an arc lamp, and its method of operation was simple in the extreme. When the normal current was flowing, the magnet, being directly in the main line, was energized, and hugged the carbon between its pole-piece and the fixed armature. When the carbon had burned away so as to reduce the current flow, the magnet fell back by force of gravity, and the carbon dropped or fed, renewing the current and causing the magnet to grip anew.

The ordinance granting the Camden and Atlantic Railroad Company the right to run electric cars on Atlantic avenue, Atlantic City, N. J., is meeting with strong opposition. It is probable that a remonstrance against it will be presented at the next meeting of Council.

OUR ST. LOUIS LETTER.

(Special Correspondence.)

For the past year, the different street car companies of this semi-tropical city have been considering the feasibility of storage batteries in connnection with a good reliable motor for street car propulsion. As a matter of course, the field has been fully canvassed by different representatives of the thousand and one systems, each claiming superiority over the other. One agent claims that the motor made by Cogwheel & Co., is not to be compared with the machine made by the Give-us-a-show-for-our-Motor-Company-Limited, as with his motor all that has to be done is to side-track the mules, put several tons of lead and acid on board and go ahead, while with the other system it is necessary to put in boilers, steam engines, electric plant of dynamos, and still keep a stable full of mules for emergencies, to say nothing of a steam scraper to run over the lines in winter to rub away icicles, sleet, etc. Then the inventor of Cogwheel & Co. comes out in an article stating that the opposition company is only endeavoring to forestall Fourth of July fireworks celebration, as every attempt they make to operate their plant results in such a slashing and crashing of the electrical current that the mind of the small boy is no longer filled with thoughts of fireworks.

But joking aside, it is tiresome to listen to the different yarns that are told by unreliable persons that have no more knowledge of the systems they represent than a boy five years old. The consequence is that the gentlemen desiring to improve their railways are disgusted and don't believe in any of them, and the matter of electric street car propulsion in St. Louis is dead for the time being at least.

Electric lighting has been very good from a sound business standpoint, and sales have been fair. The Heissler Company shops appear to be running full-handed and their long distance central station has the lead so far for commercial lighting in stores, etc. Col. Beetle, of the Western Electric Company, said grace over a dinner at the Southern Hotel last week, and left for Kansas City. Messrs. Bailey & Rustling, of the Thomson-Houston Company, spent a few hours with us not long ago. Brother Bailey's summer overcoat, made from the skin of a Polar bear, created quite a sensation at the matinee, where he was mistaken for the representative of a Chicago minstrel band just organized for an attack on the malarial Misssissippi Valley and adjacent hill-tops. Mr. Rustling left for Arkansaw for a premeditated attack on Little Rock and the sawmills in that vicinity. I hope he has had good luck and increased his sales. Mr. Allen, Secretary of the Brush Electric Association, is in New Mexico. Mr. Porter, of the Porter Electrical Company, reports business as excellent. He has in hand several large contracts for the Edison Company, with considerable work in sight. The Edison Company report sales lately made as follows:

St. Joseph Lead Company of Bonne Terre, Mo.	600 lights.
Pauley Jail Building Co.	200 "
Comades Chair Co.	200 "
Excelsior Springs Hotel Co.	600 "
Post Dispatch Publishing Co.	350 "
H. C. Cole & Co., Chester, Ill.	100 "
Independence, Mo.	500 "
Anna, Ill.	300 "
Total	2,850 lights.

Besides actual installations noted above, Mr. Porter is wiring for many large business blocks amounting to over 5,000 lights. The business of contracting for wiring business blocks in anticipation of a central station in the near future, has assumed good proportions.

W. Preston Hix, of the Edison Company, is in the city presumably looking up business for his company. The boom in Kansas City no longer boometh, and as a consequence, electric light agents fight shy of the town.

A. M.

St. Louis, April 27, 1888.

ELECTRICAL PATENTS

(Copies of any Patents in the following List will be sent to any address on receipt of twenty-five cents.)

INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING APRIL 31, 1888.

381,907 Pneumatic railway and conveyer; Thomas A. Connolly and Anthony A. Connolly, Washington, D. C.

381,915 Electric lighting apparatus for railroad cars; Harry E. Day, New York, N. Y.

381,938 System of telephonic intercommunication; John A. McCoy, Medford, Mass.

381,941 Secondary battery; A. V. Meserole, New York, N. Y.

381,953 Electric penholder; Charles W. Reitter, Denver, Col.

381,968 381,969 382,279 Electro-magnetic motor. 381,970 System of electrical distribution; Nikola Tesla, New York, N. Y., assignor of one-half to Charles F. Peck, Englewood, N. J.

381,992 381,993 Watchman's time detector; George B. Fessenden, Boston, Mass.

382,001 Electric gas lighter; Charles W. Holtzer, Brookline, Mass.

382,110 Protector for electric lamp sockets; Christopher P. Reilly, New York, assignor of two-thirds to Thomas F. Ryder, West New Brighton, N. Y.

382,112 Automatic switch for secondary batteries; John S. Sellon, Hatton Gardens, County of Middlesex, England, assignor to the Electrical Accumulator Company, of New York.

382,165 Automatic temperature regulator; Warren S. Johnson, Milwaukee, Wis.

382,174 Armature for dynamo-electric machines; Robb Mackie, Troy, N. Y., assignor to Jno. B. Tibbets, same place.

382,195 Telegraph receiver; Charles Selden, Baltimore, Md.

382,231 Electric igniting apparatus; Leon Hen and Rodolphe Weinmann, Brussels, Belgium.

382,249 Automatic electric gas burner; Elmer E. Bailey, West Everett, assignor of one-half to William Sears, Malden, Mass.

382,253 Fire alarm signal circuit; William Carroll, Chicago, Ill., assignor to John P. Barrett, same place.

382,272 Insulating joint; James T. Robb, New York, N. Y., assignor to Bergmann & Company, same place.

382,280 382,281 Electrical transmission of power.

382,282 Method of converting and distributing electric currents; Nikola Tesla, New York, N. Y.

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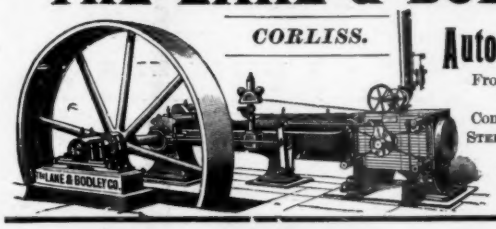

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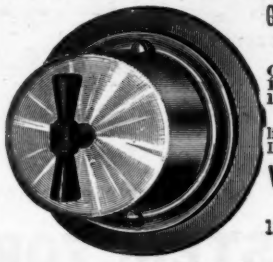

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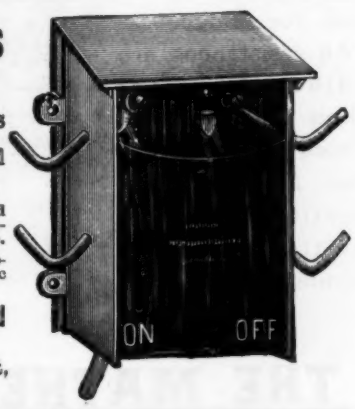

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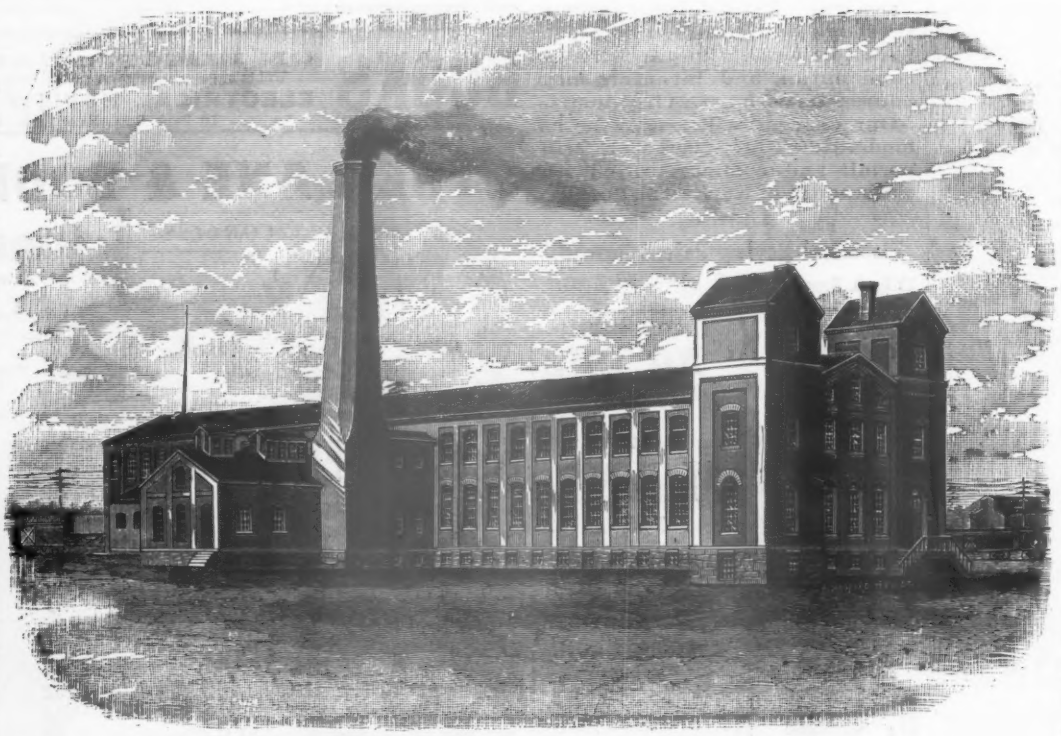

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